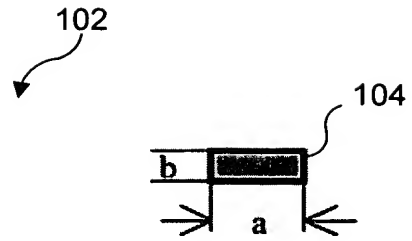
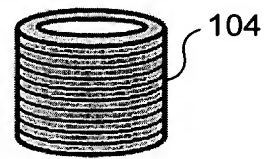


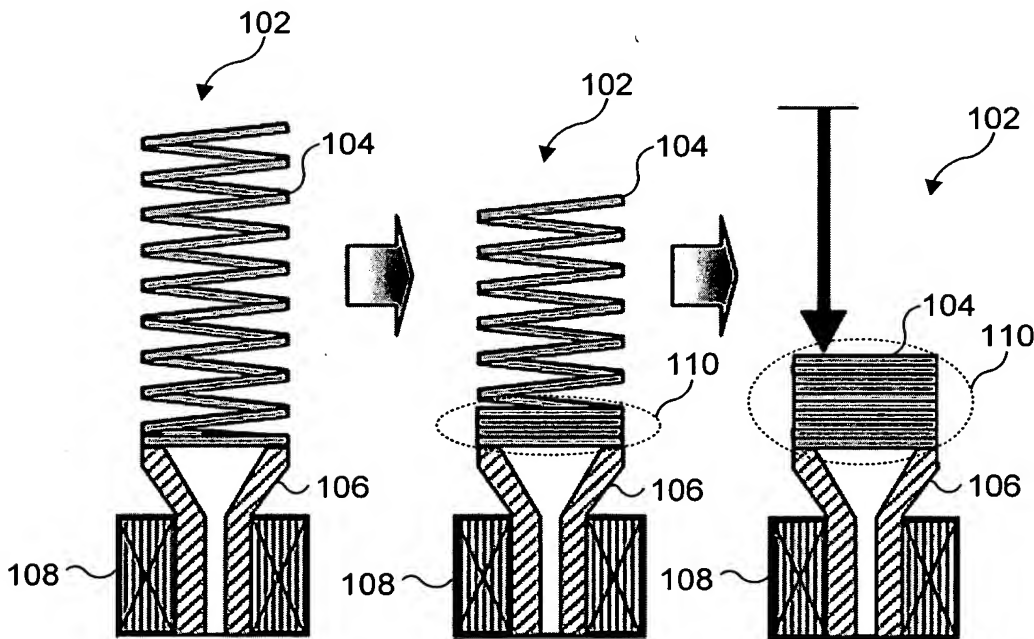
**FIG. 1A**  
**PRIOR ART**



**FIG. 1B**  
**PRIOR ART**



**FIG. 1C**  
**PRIOR ART**

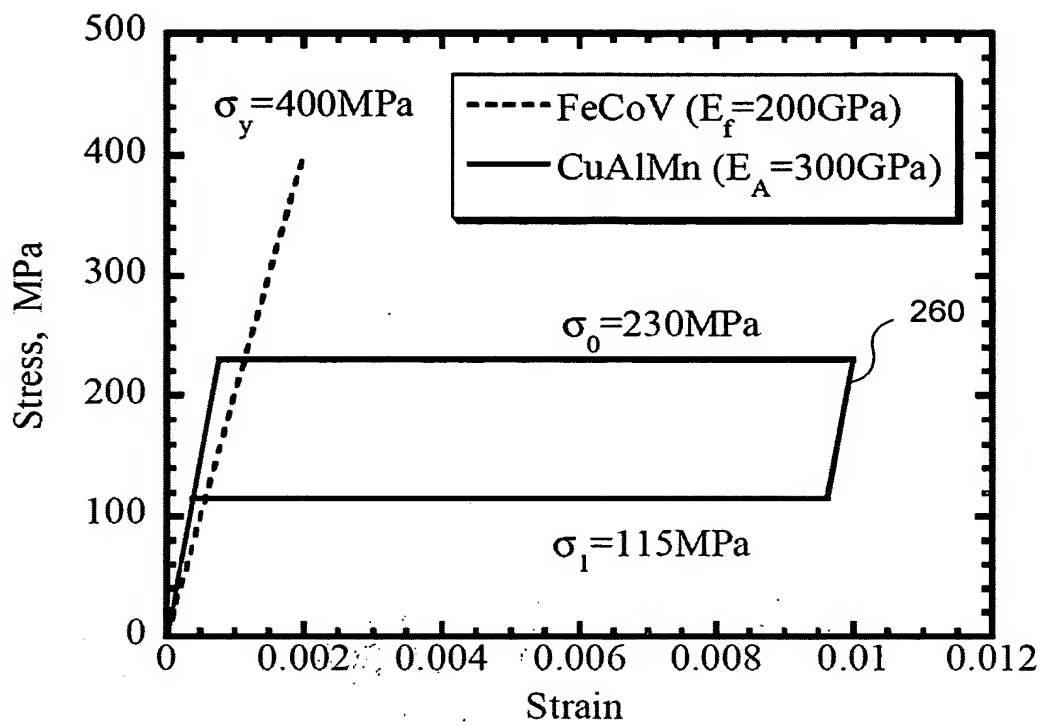


**FIG. 2A**

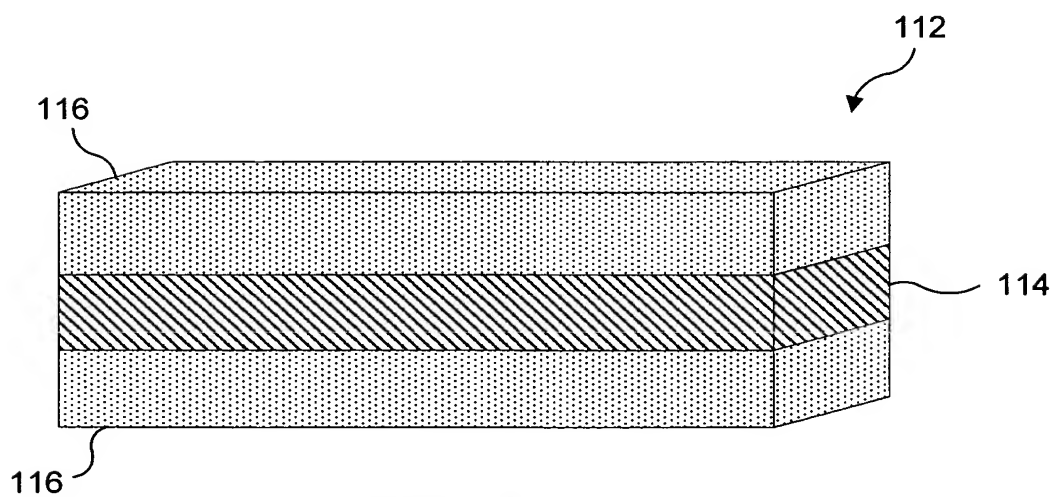
**FIG. 2B**

**FIG. 2C**

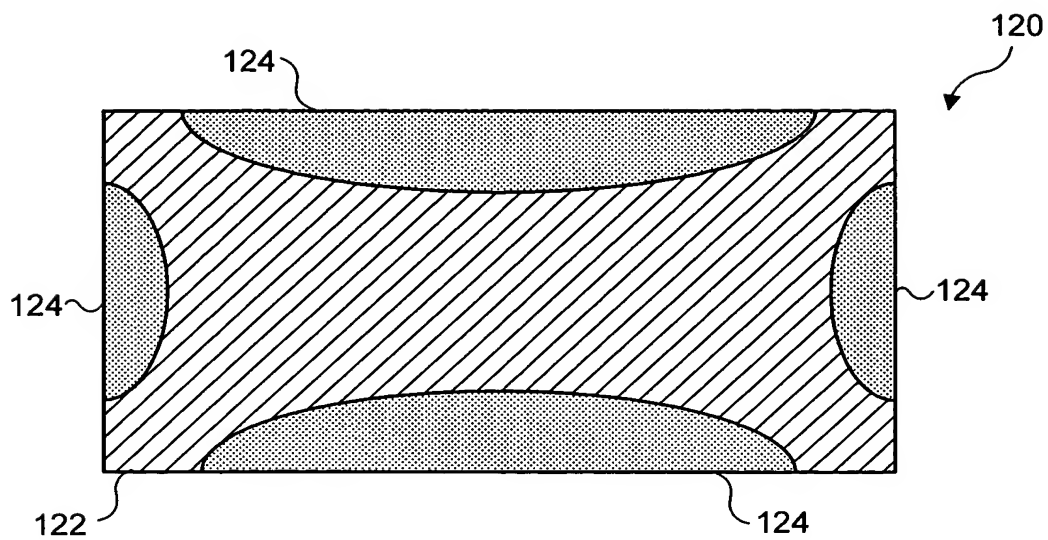
**PRIOR ART**



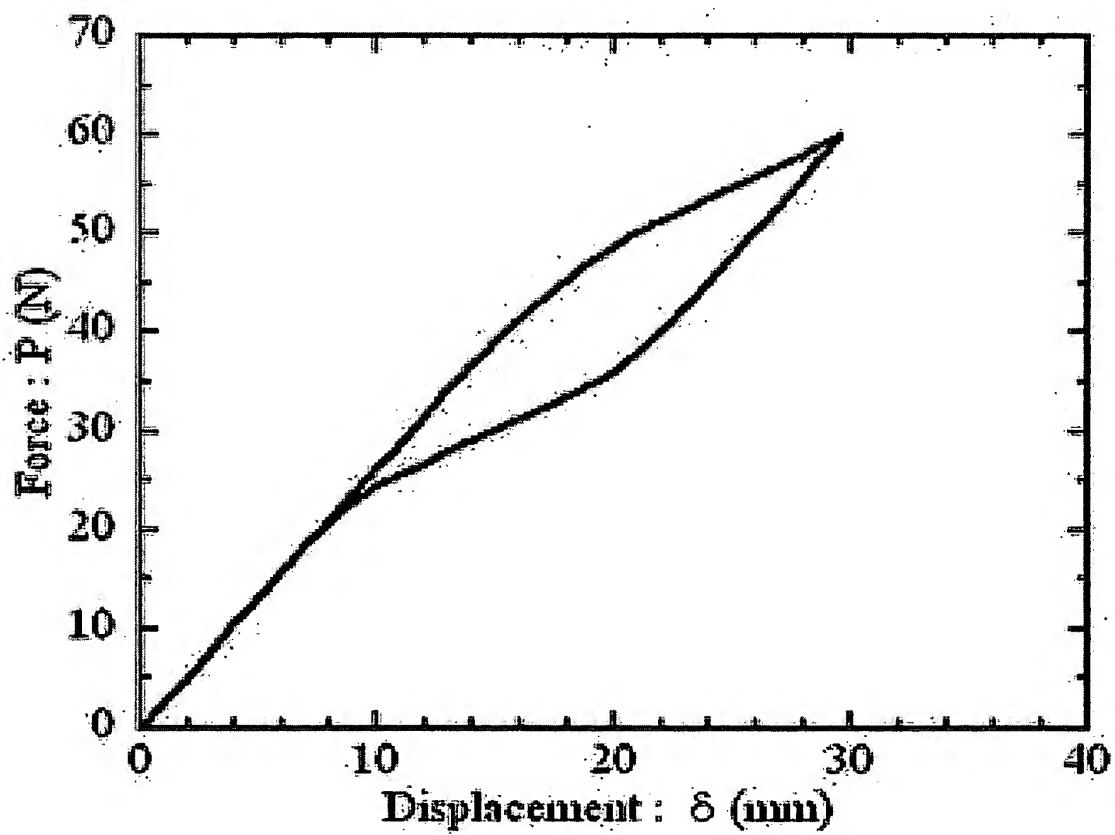
**FIG. 3**



**FIG. 4**  
**PRIOR ART**

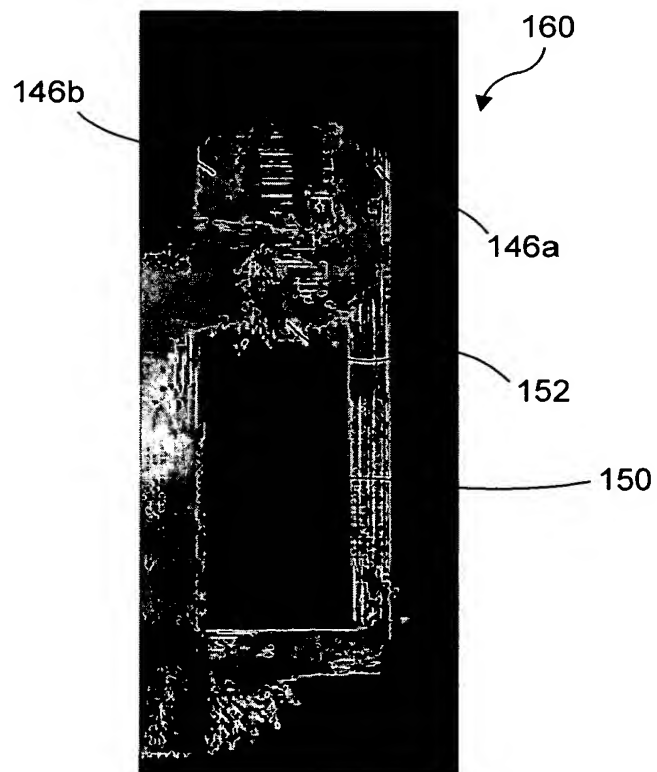
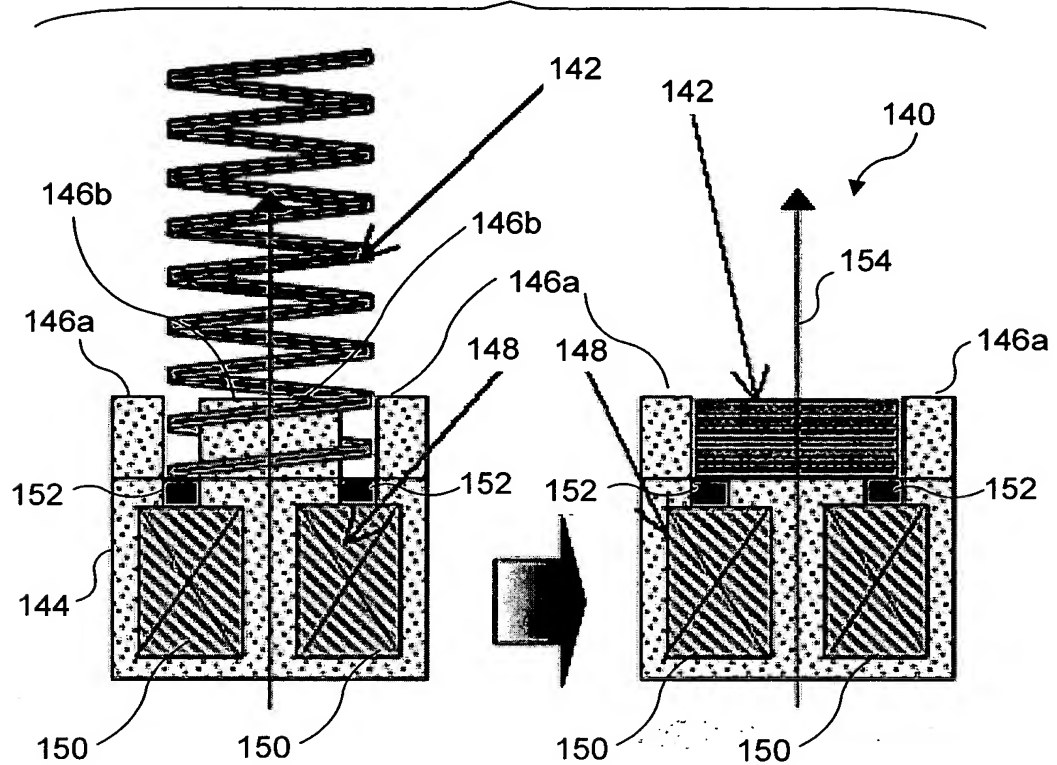


**FIG. 5**

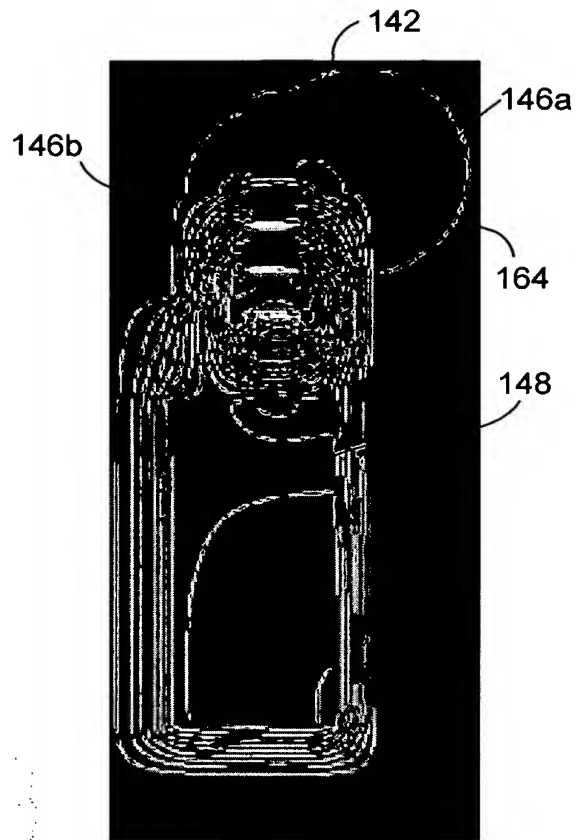


**FIG. 6**

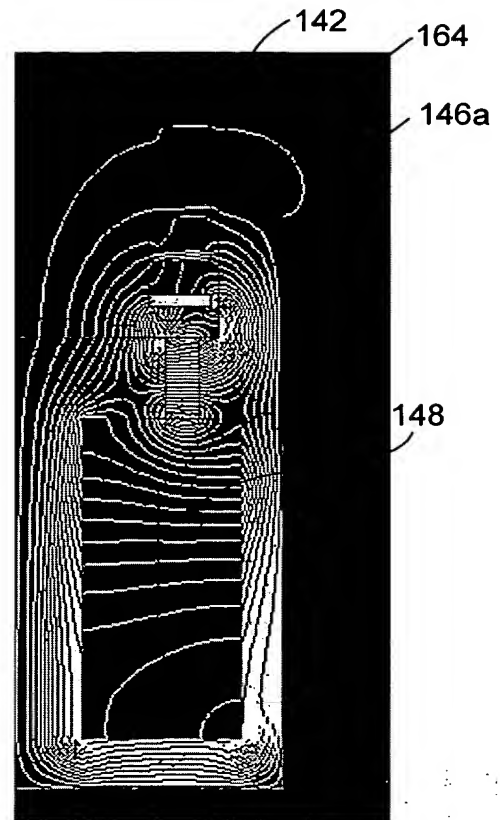
**FIG. 7**



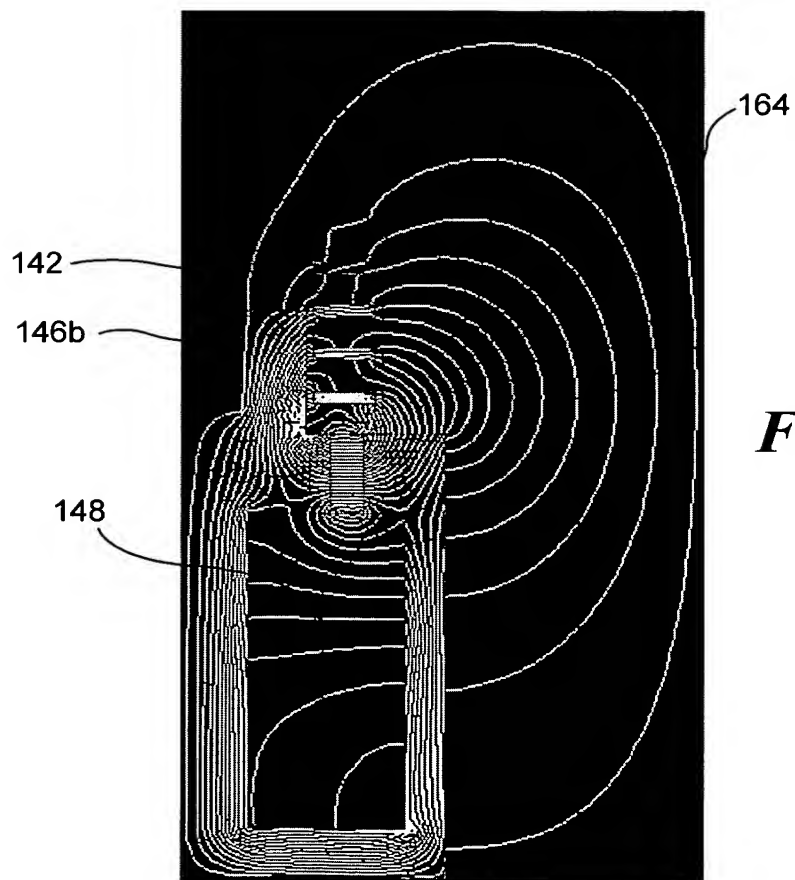
**FIG. 8**



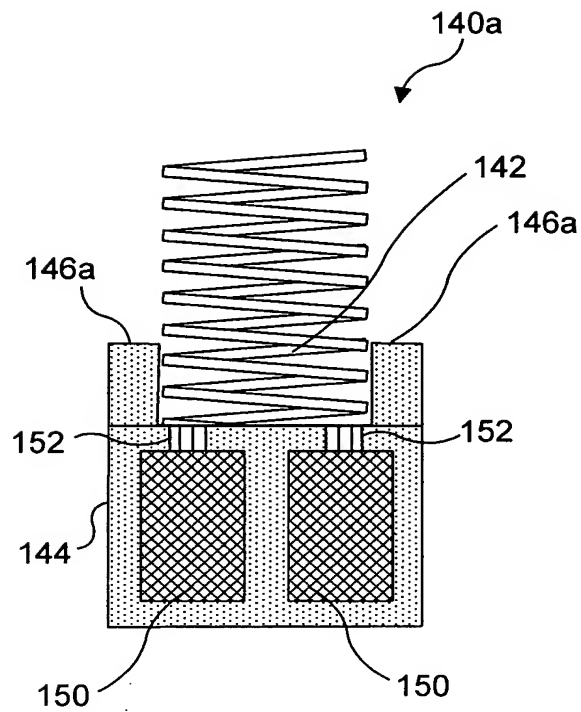
**FIG. 9A**



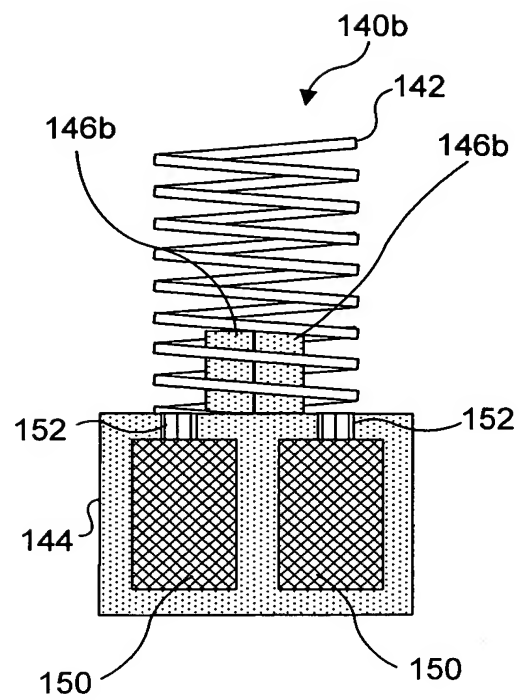
**FIG. 9B**



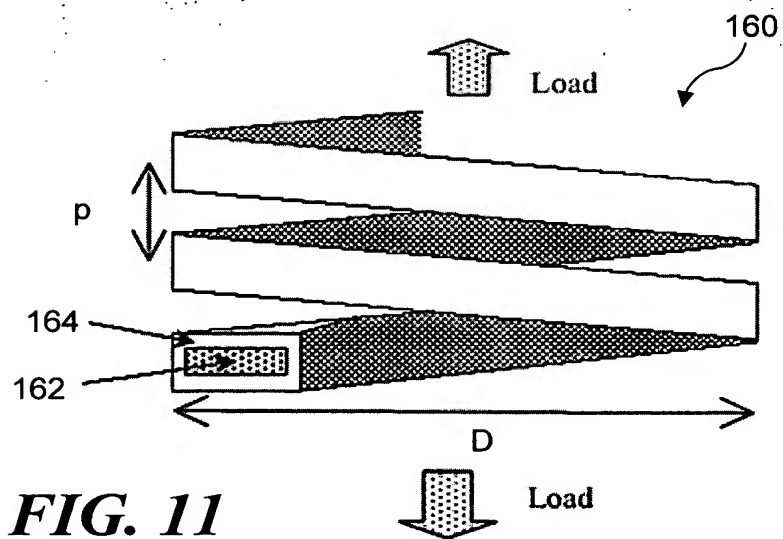
**FIG. 9C**



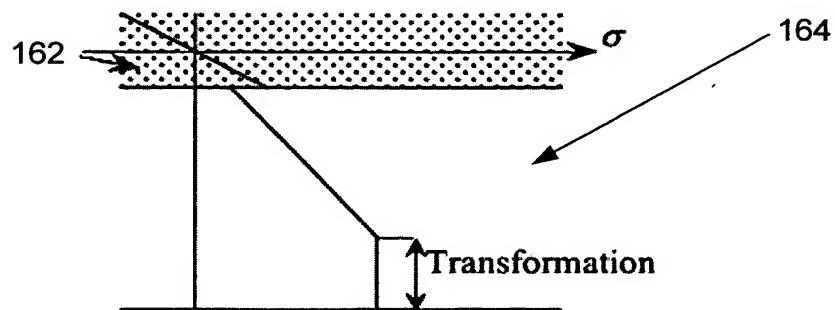
**FIG. 10A**



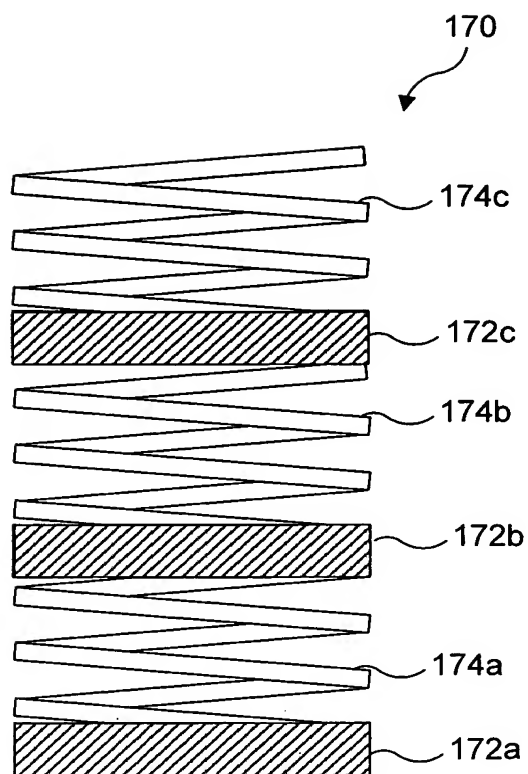
**FIG. 10B**



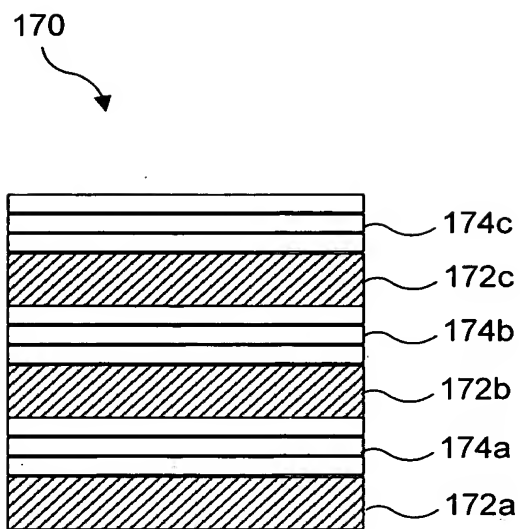
**FIG. 11**



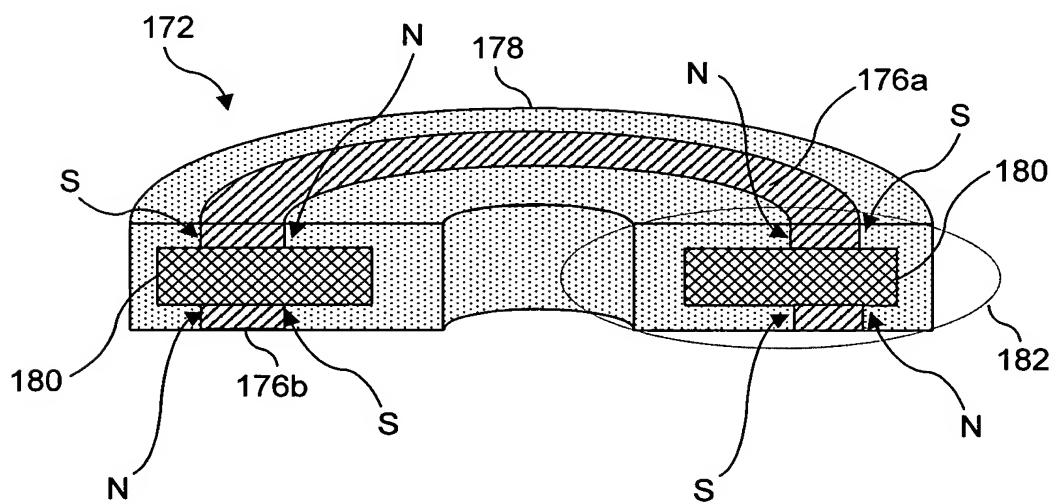
**FIG. 12**



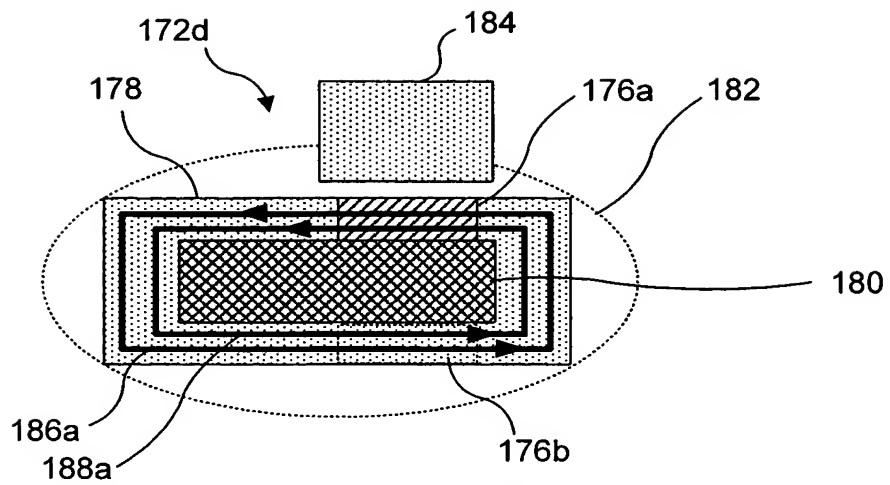
**FIG. 13A**



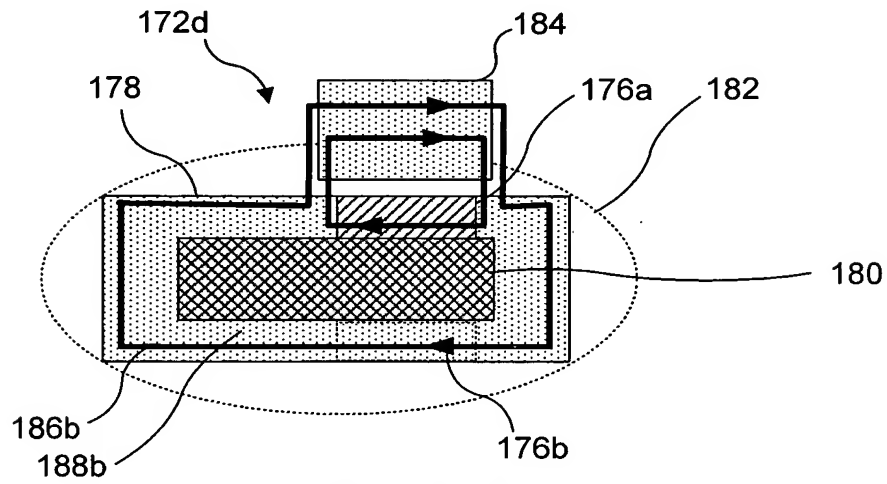
**FIG. 13B**



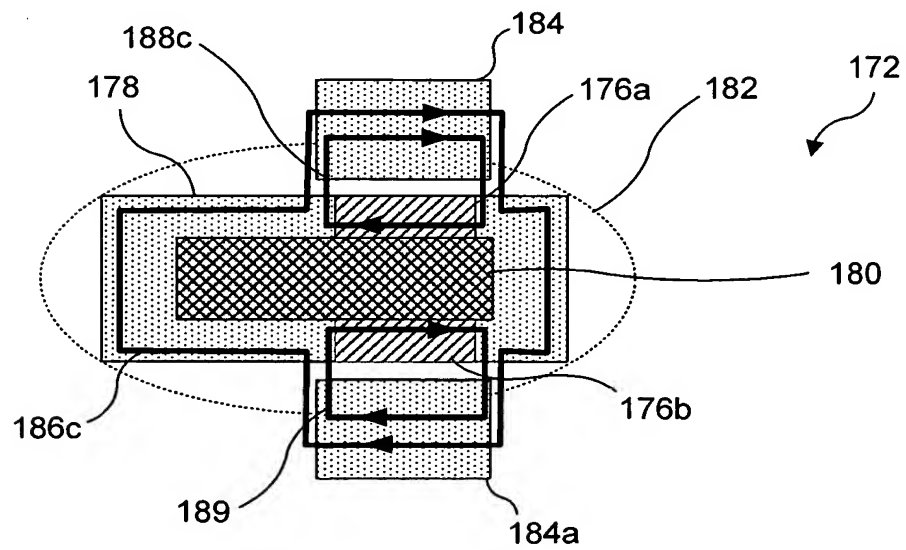
**FIG. 14**



**FIG. 15A**

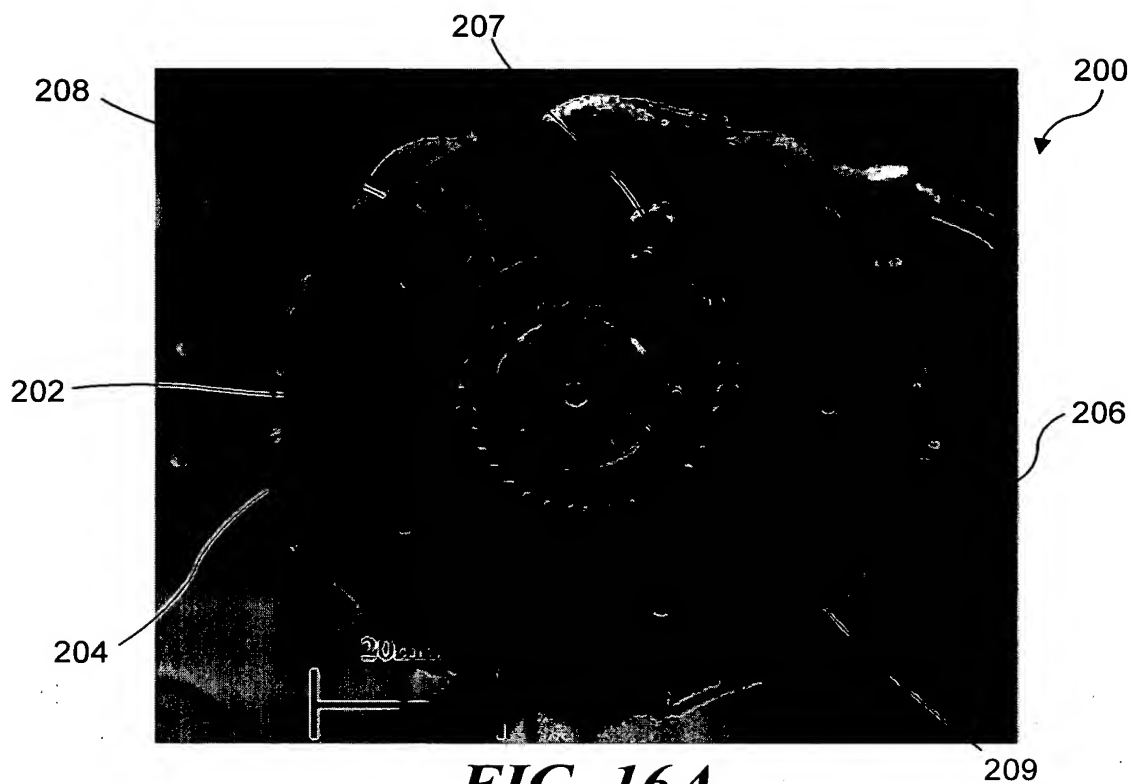


**FIG. 15B**

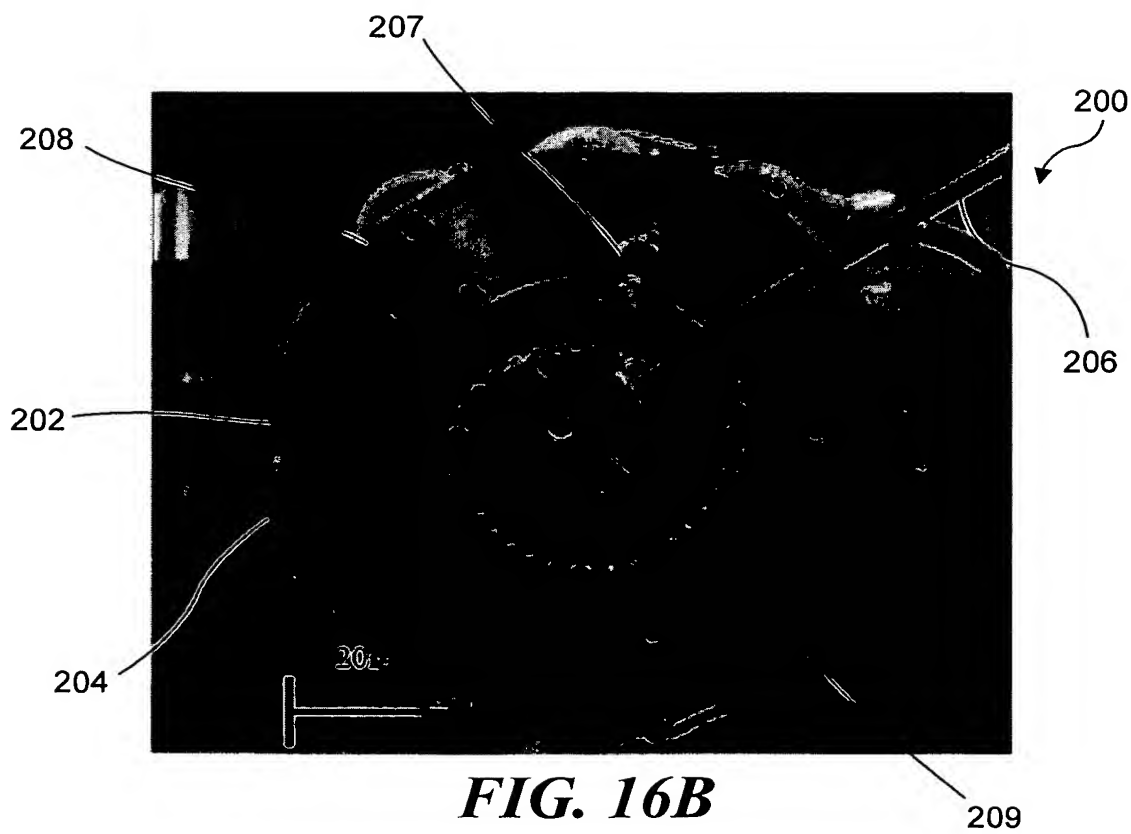


**FIG. 15C**

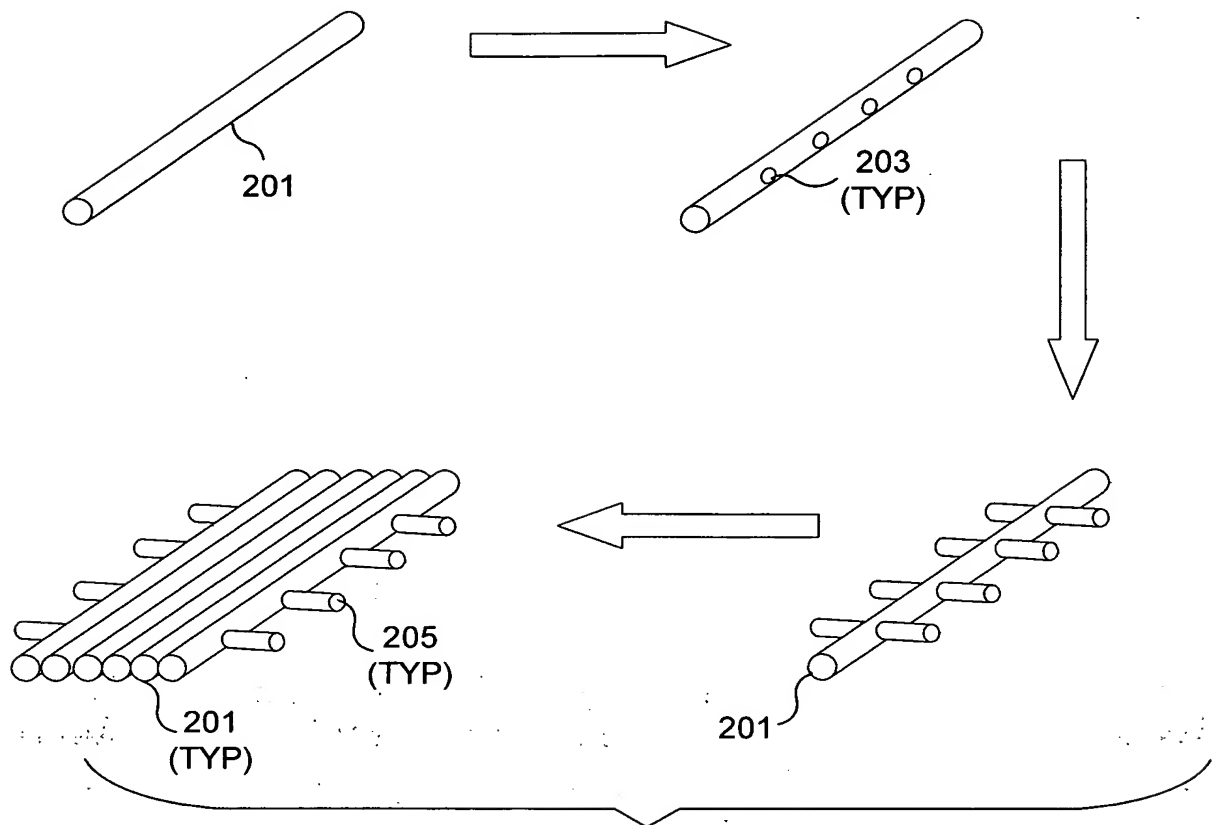




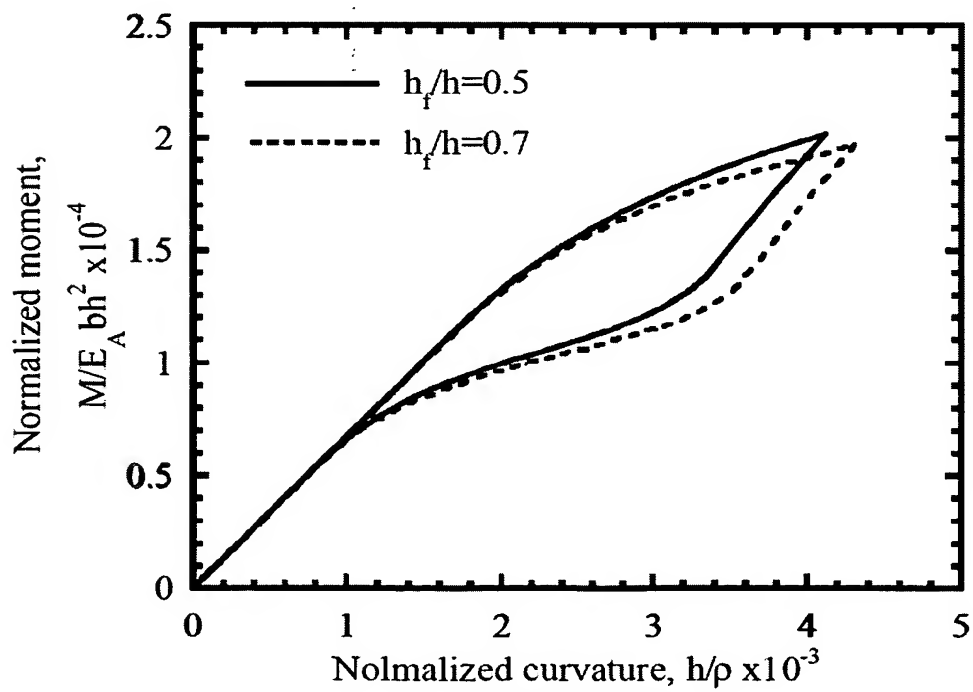
**FIG. 16A**



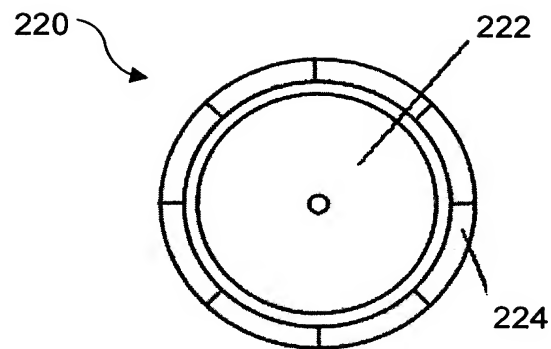
**FIG. 16B**



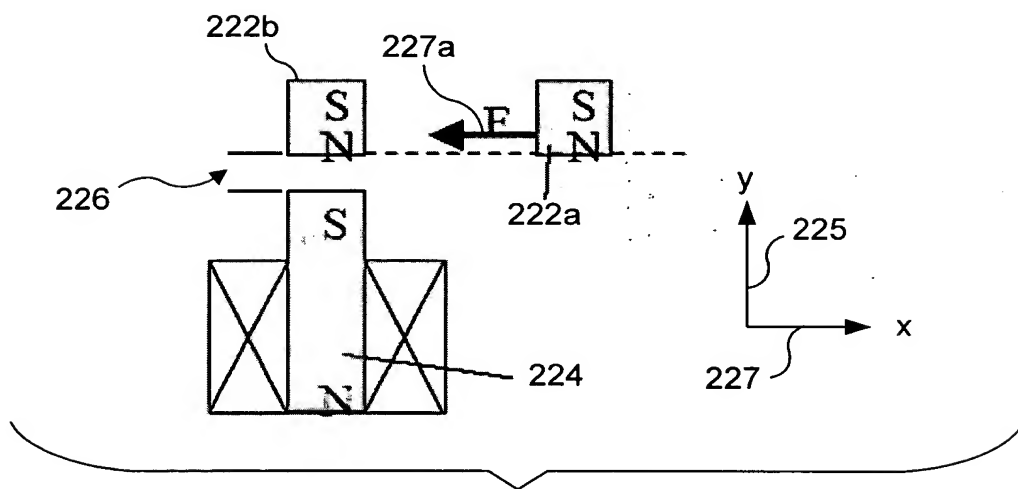
**FIG. 16C**



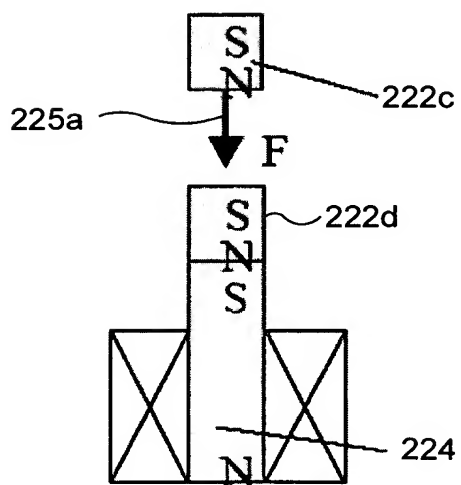
**FIG. 24**



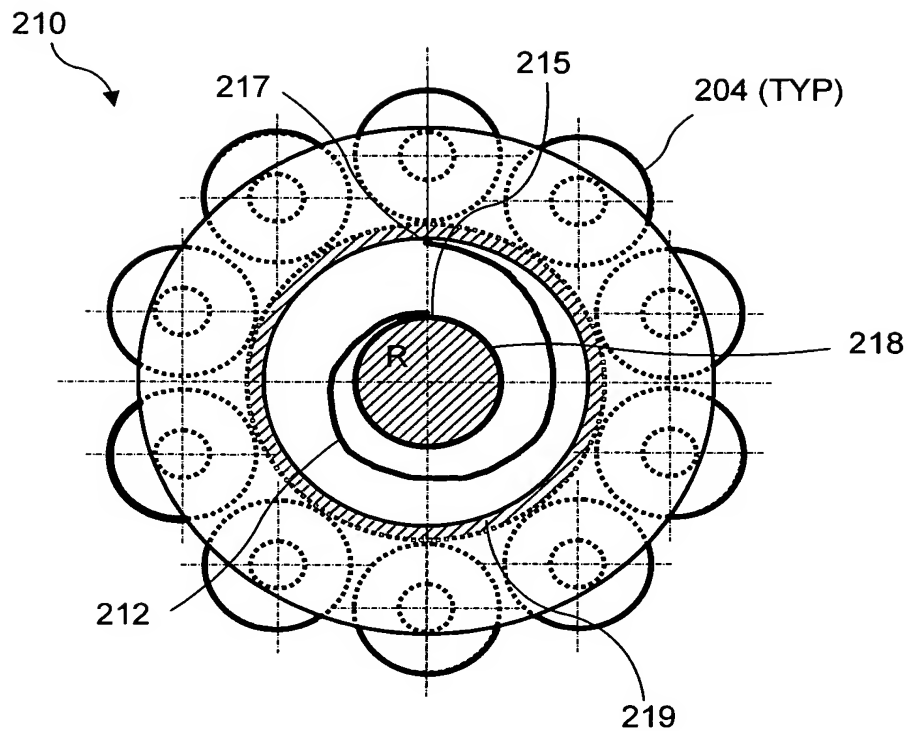
**FIG. 17A**  
**PRIOR ART**



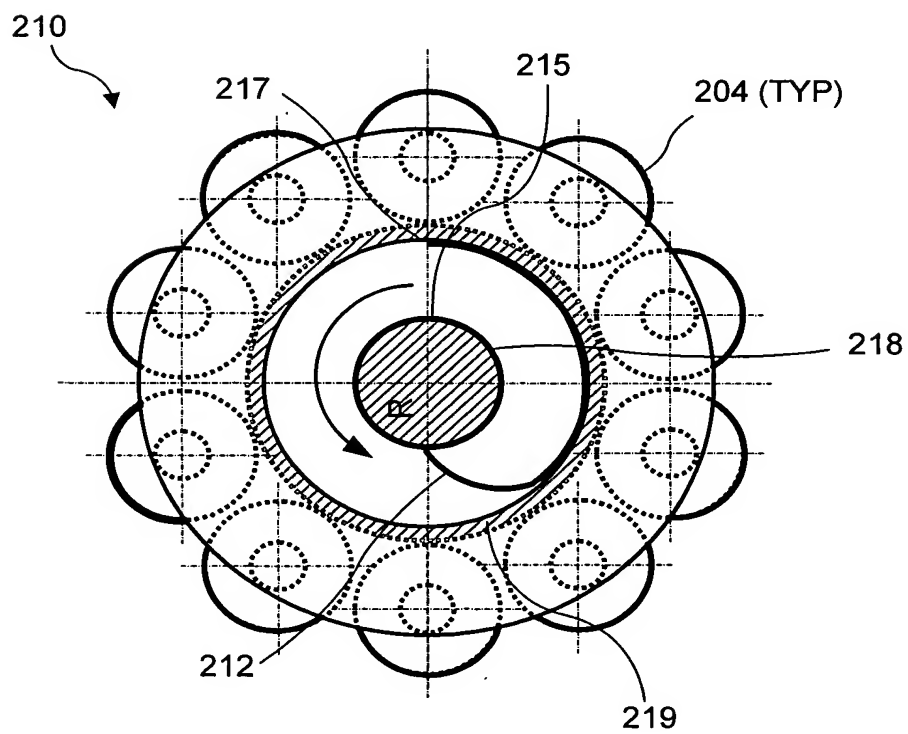
**FIG. 17B PRIOR ART**



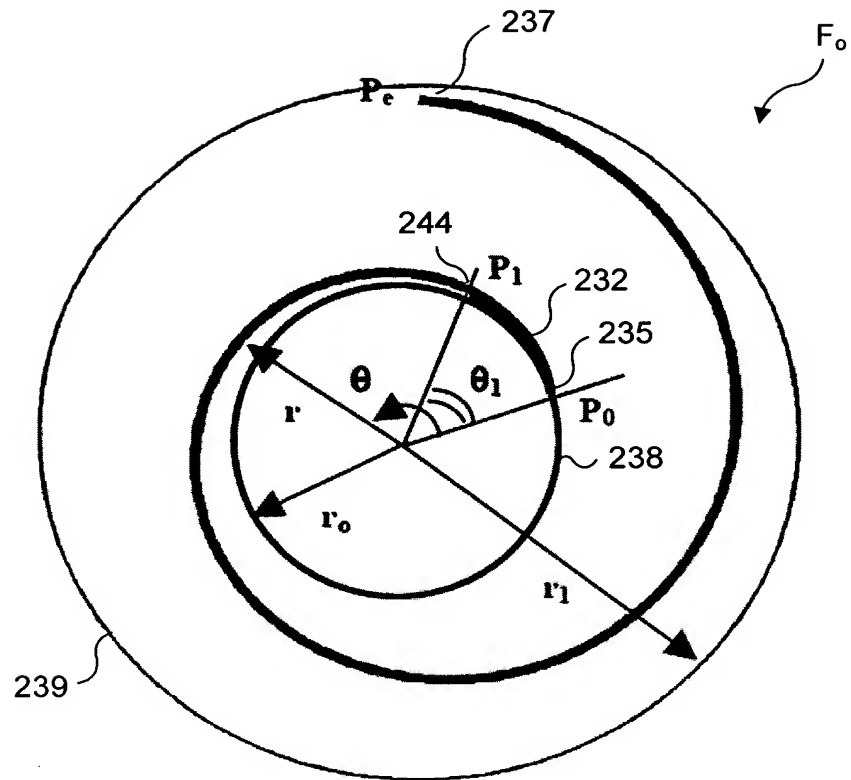
**FIG. 17C**



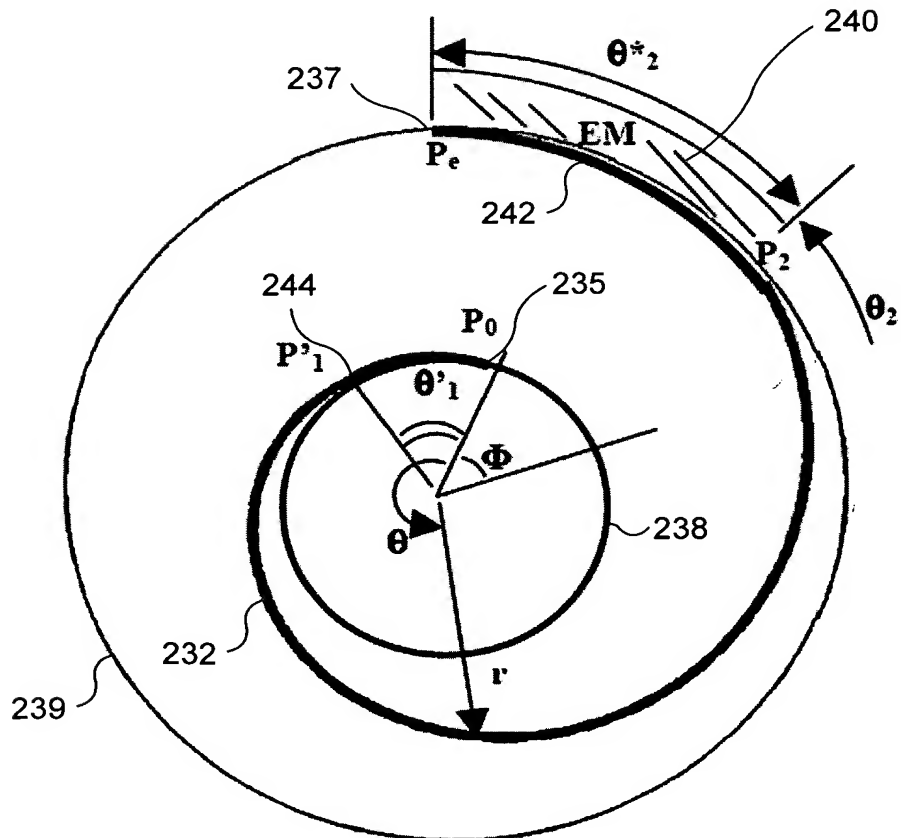
**FIG. 18A**



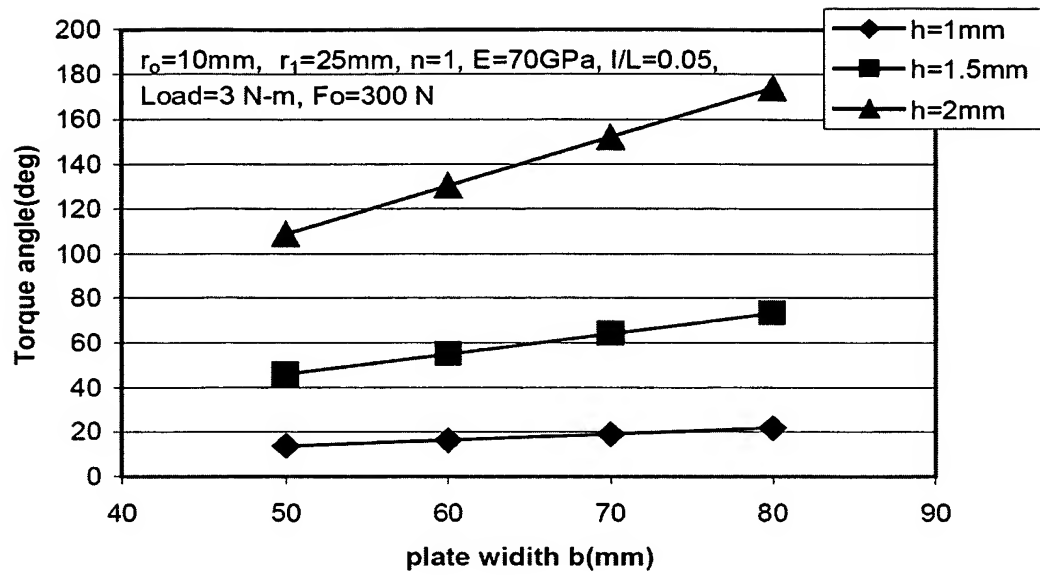
**FIG. 18B**



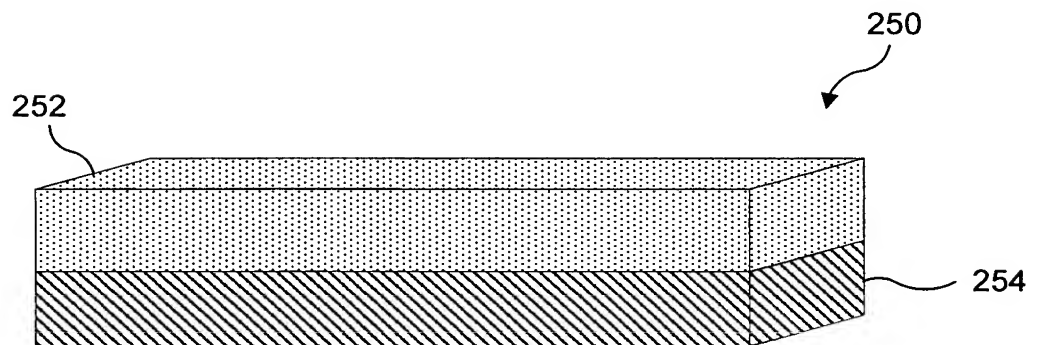
**FIG. 19A**



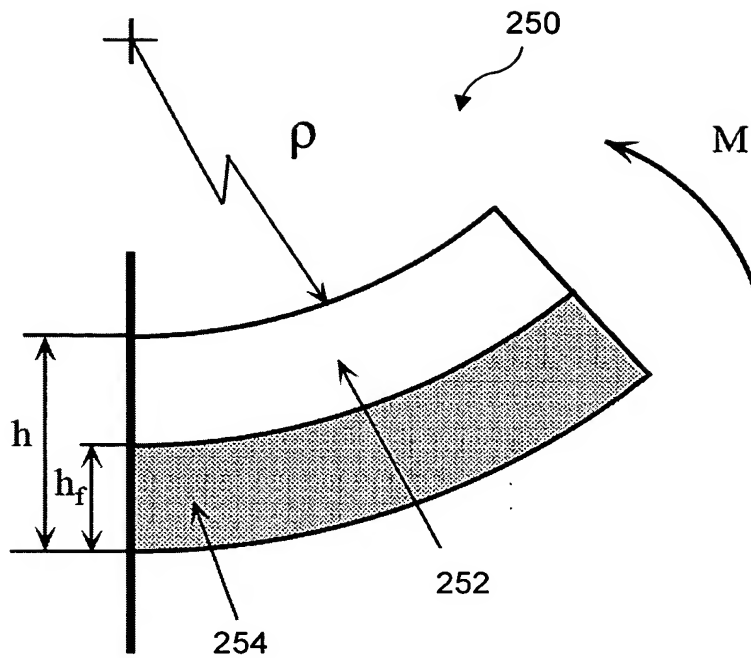
**FIG. 19B**



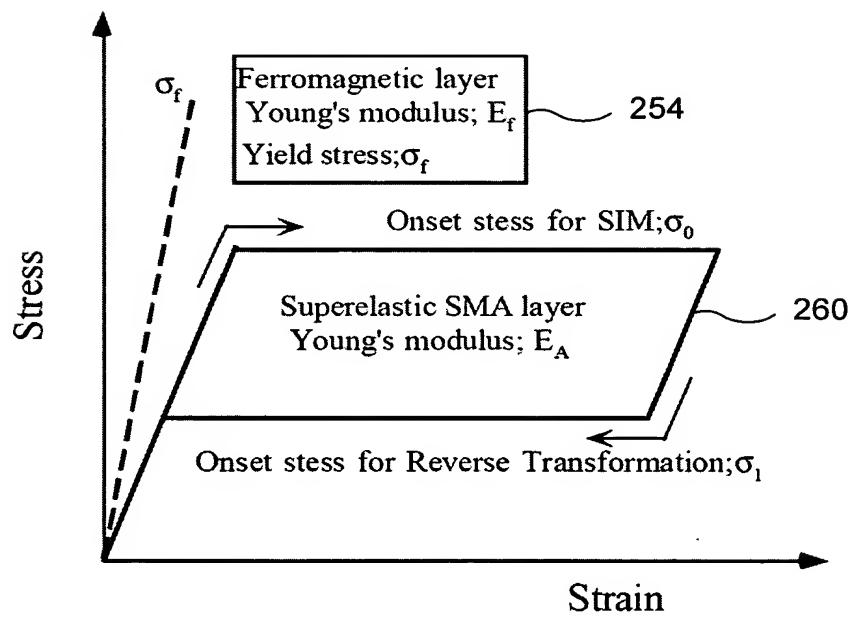
**FIG. 20**



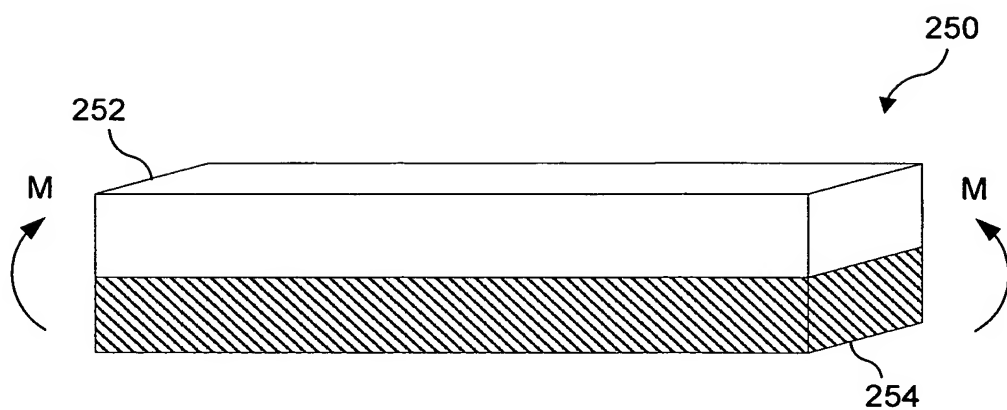
**FIG. 21**



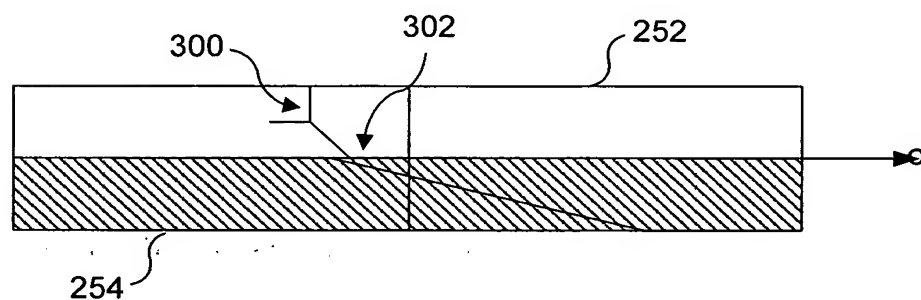
**FIG. 22**



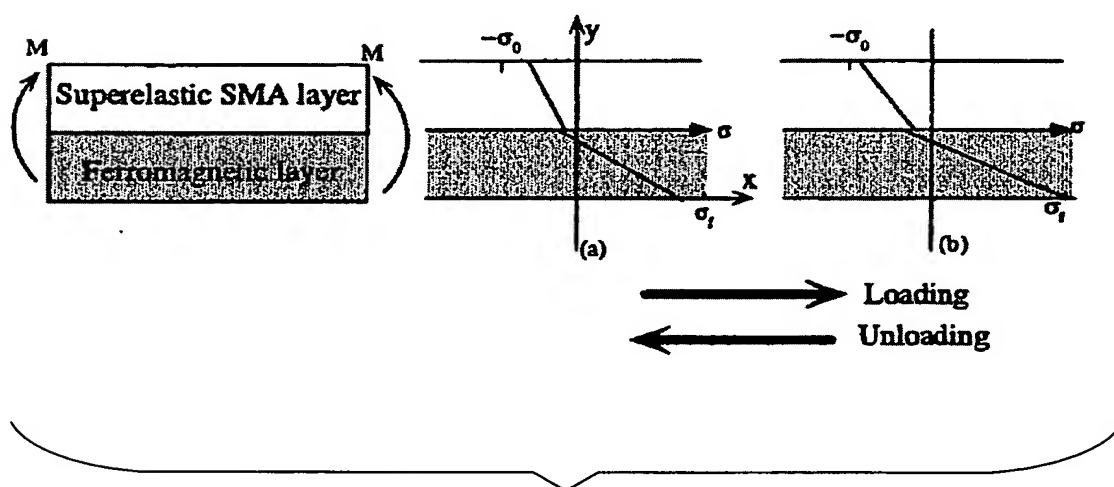
**FIG. 23**



**FIG. 25A**



**FIG. 25B**



**FIG. 26A**



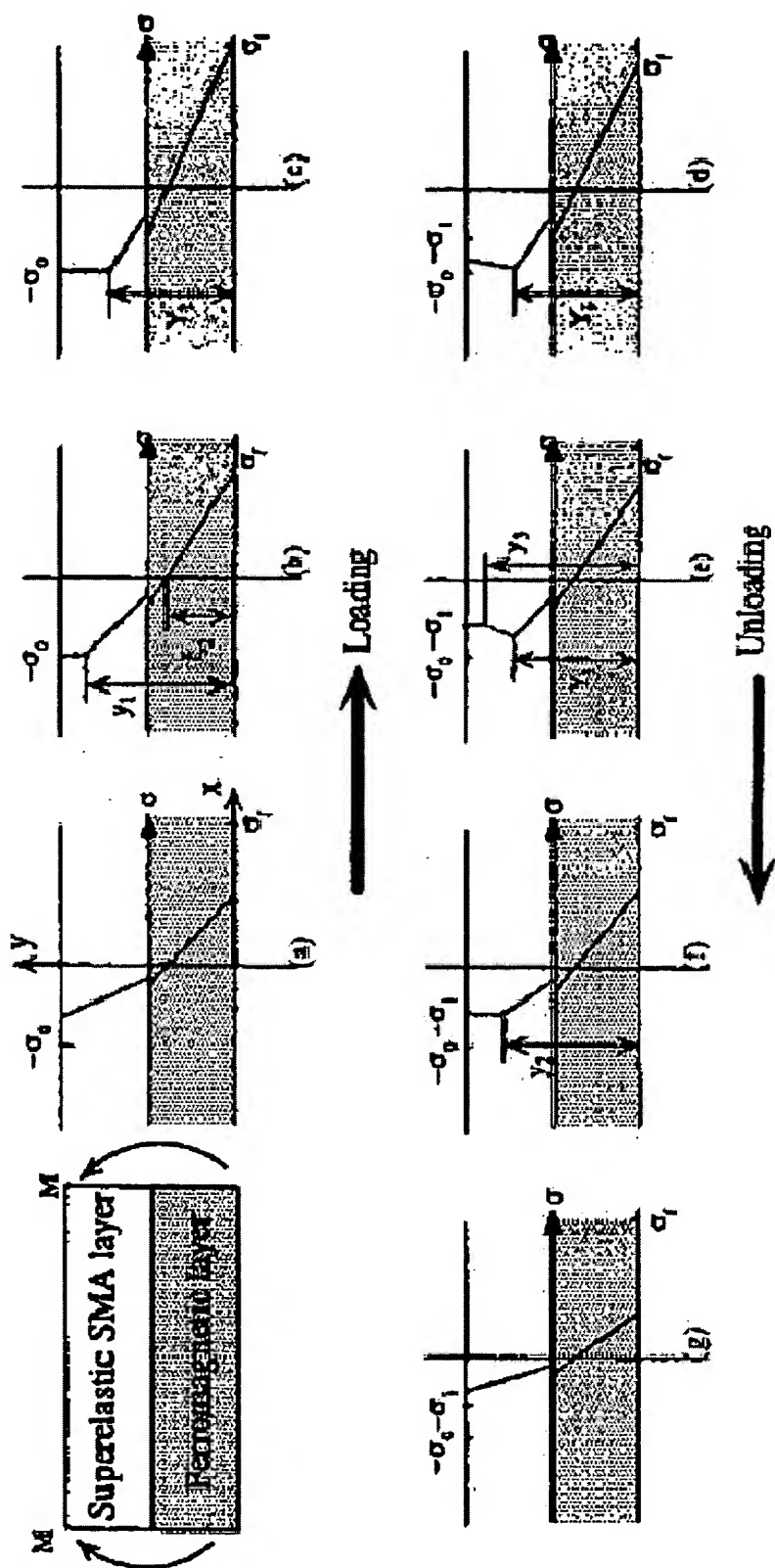


FIG. 26B

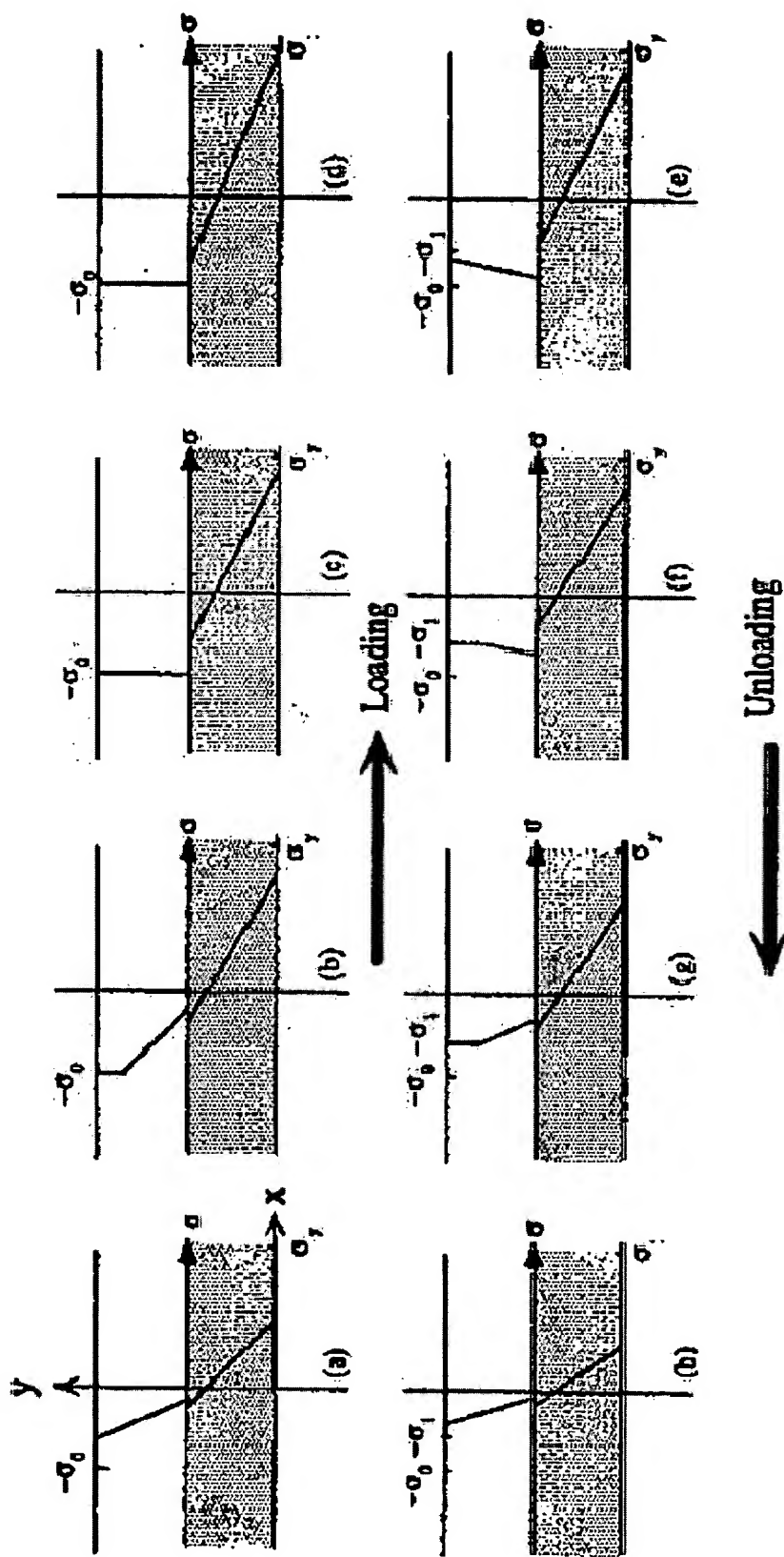


FIG. 26C

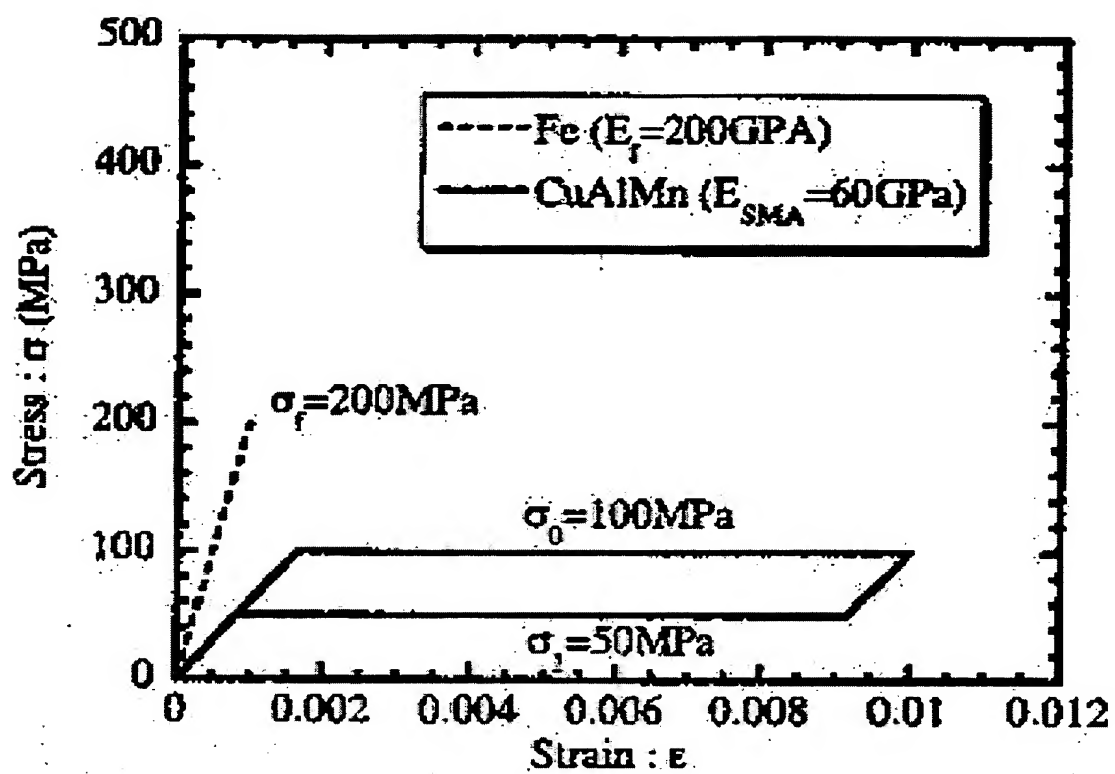


FIG. 27

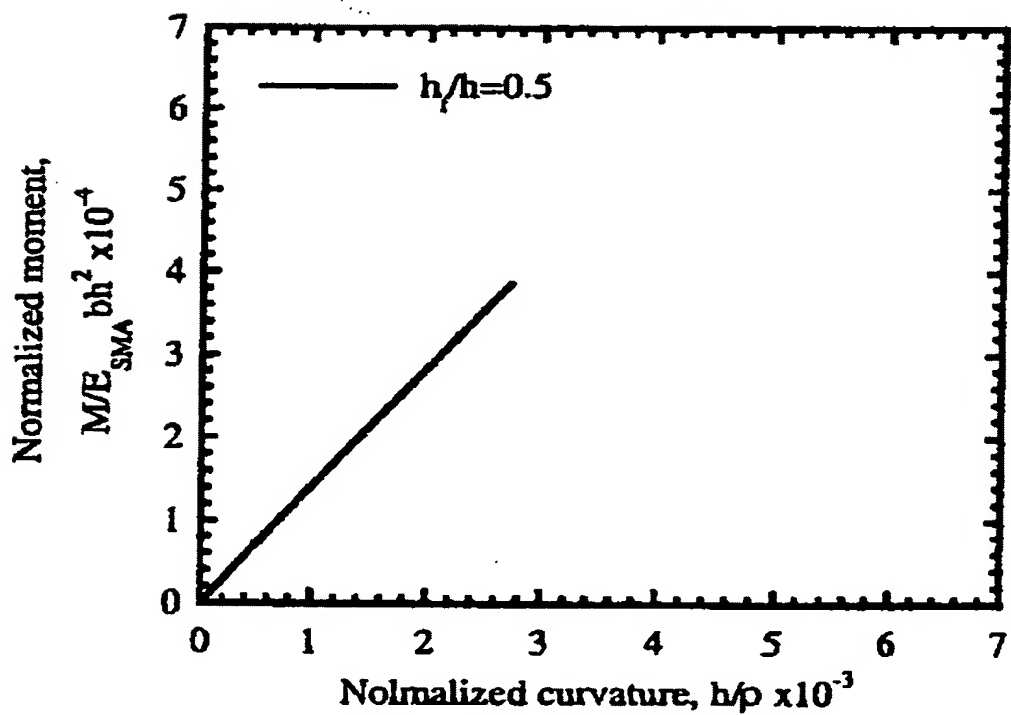
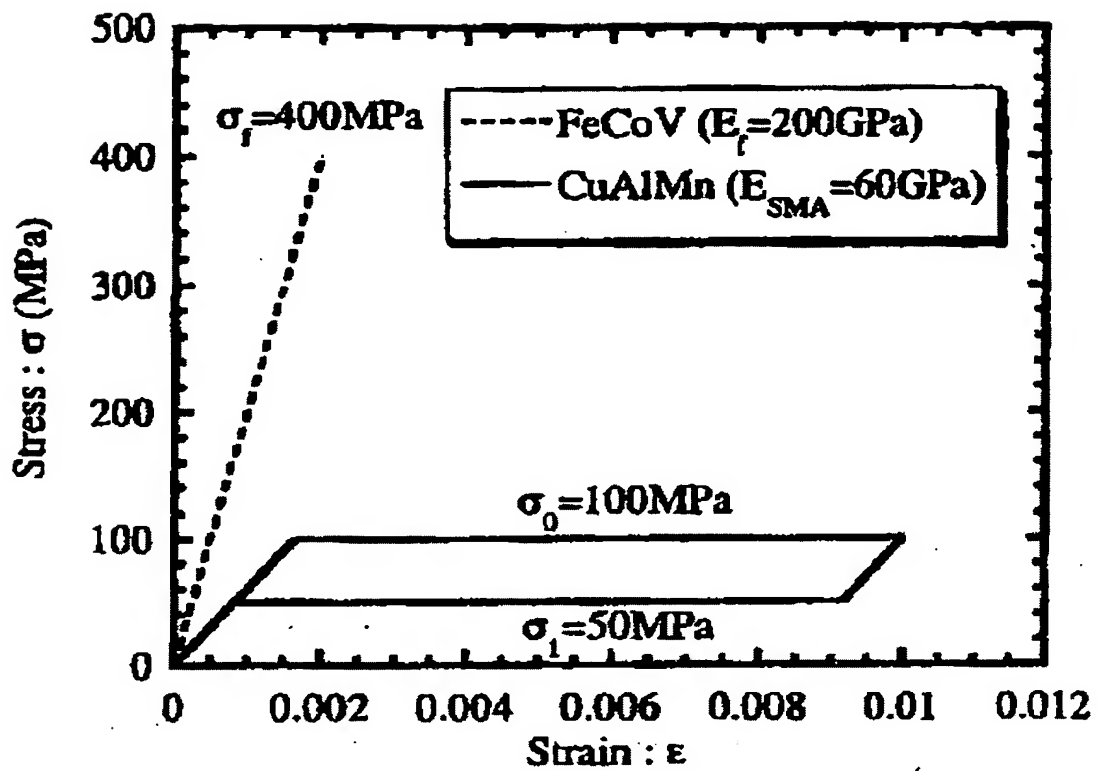
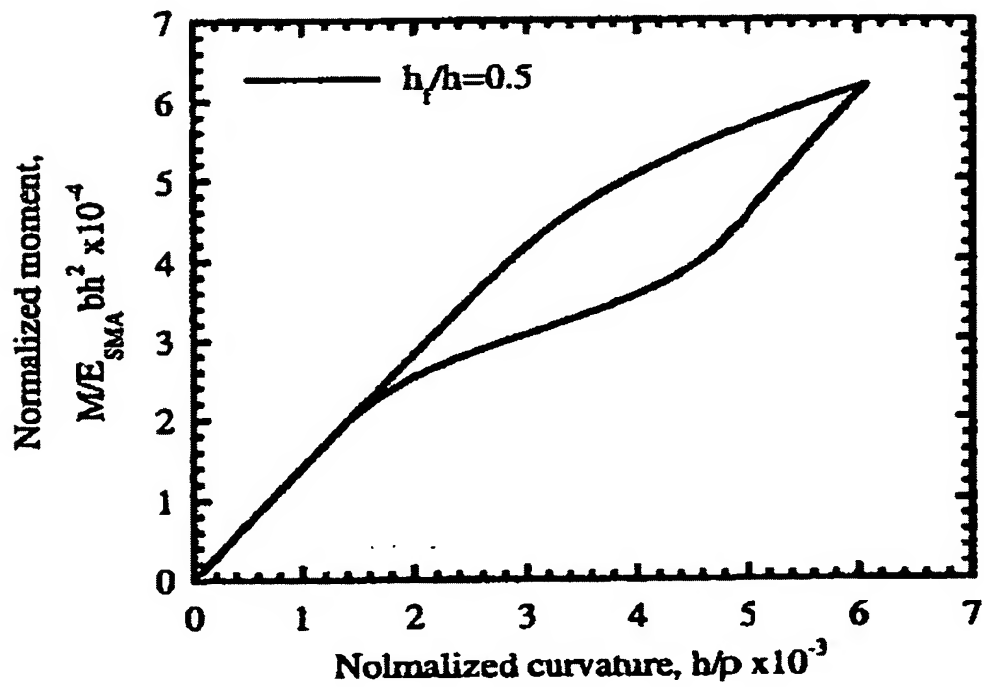


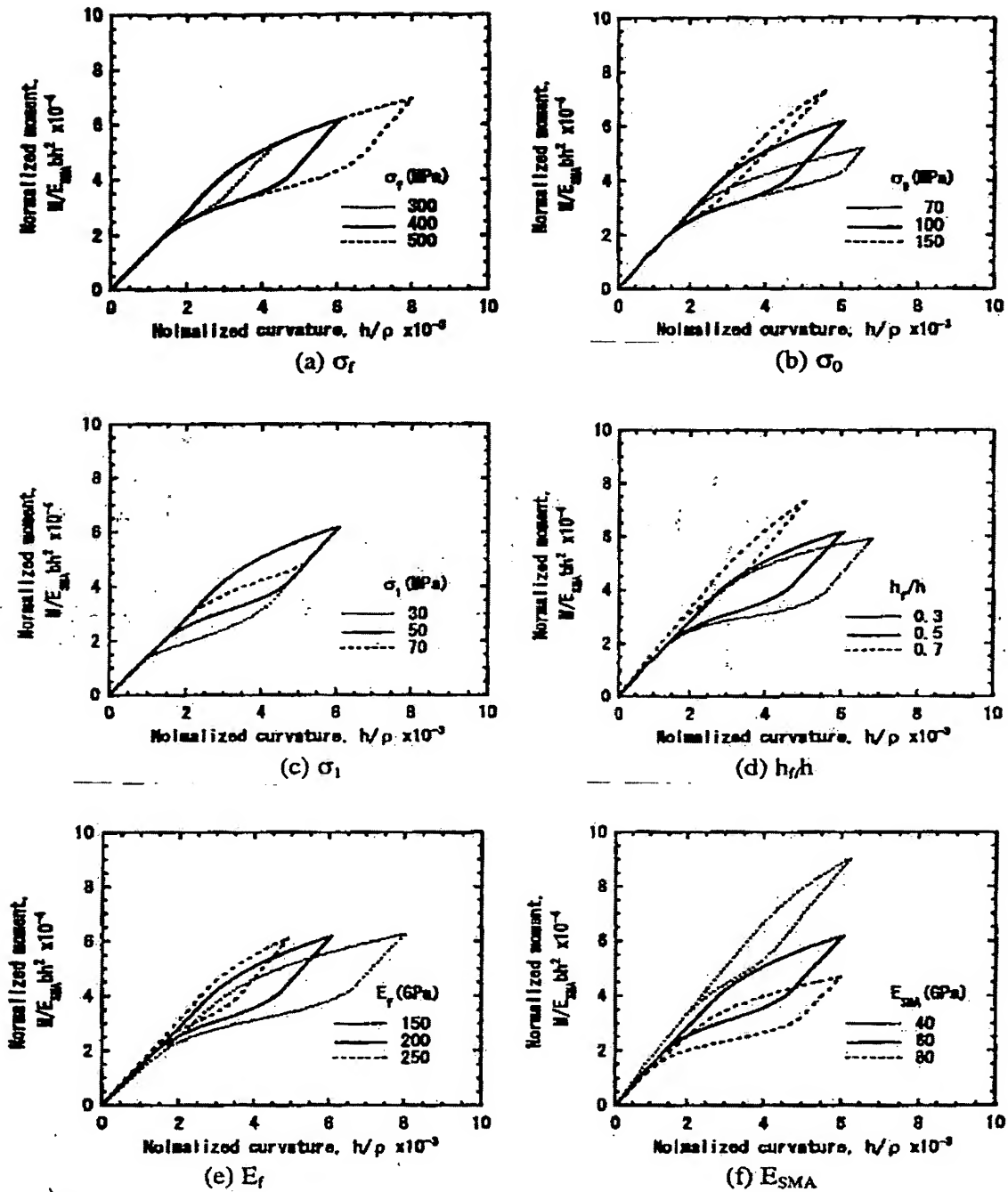
FIG. 28



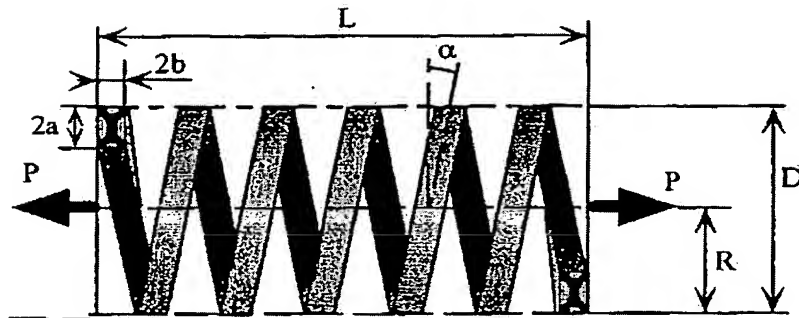
**FIG. 29**



**FIG. 30**

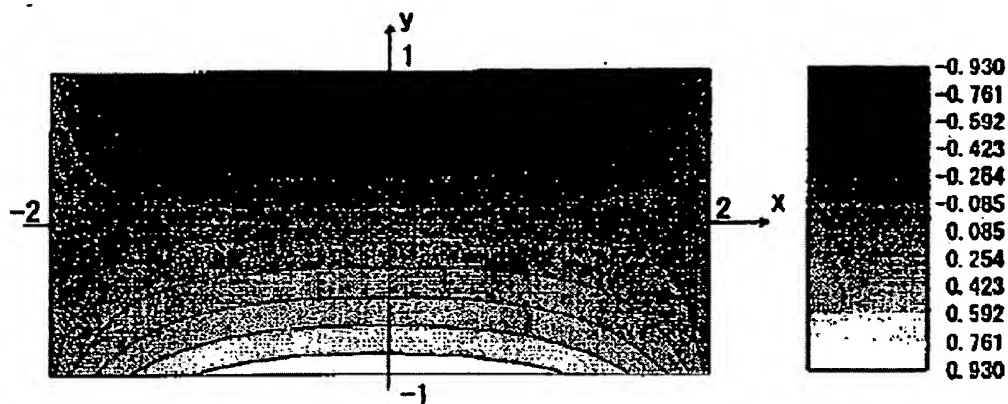


**FIG. 31**

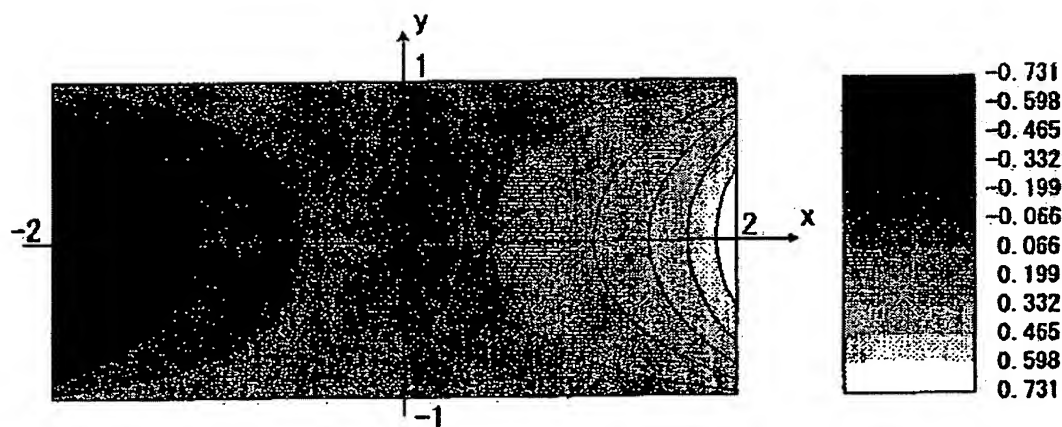


$D$ : the diameter of spring ( $D=2R$ )  
 $d$ : the diameter of wire  
 $p$ : the pitch of one cycle  
 $n$ : the number of turns  
 $L$ : the length of spring without load ( $L=np$ )  
 $\alpha$ : the inclined angle of the wire to the x-y plane

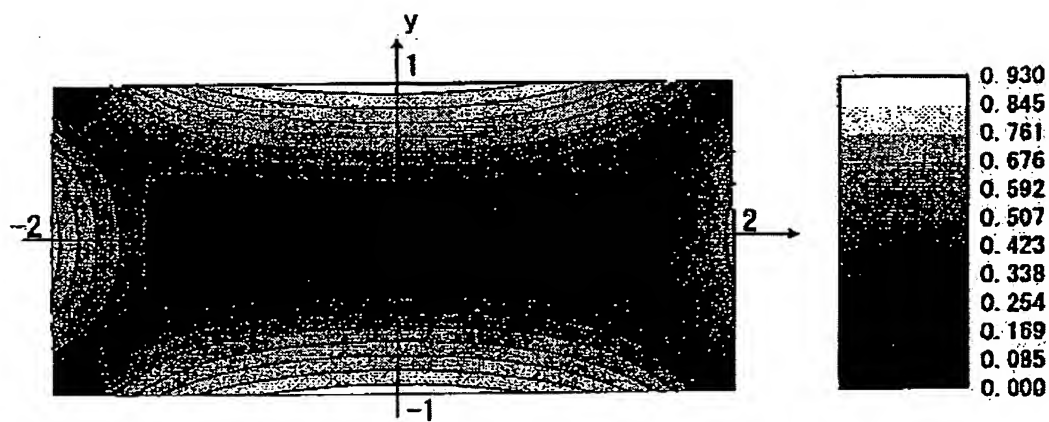
**FIG. 32**



**FIG. 33A**



**FIG. 33B**



**FIG. 33C**

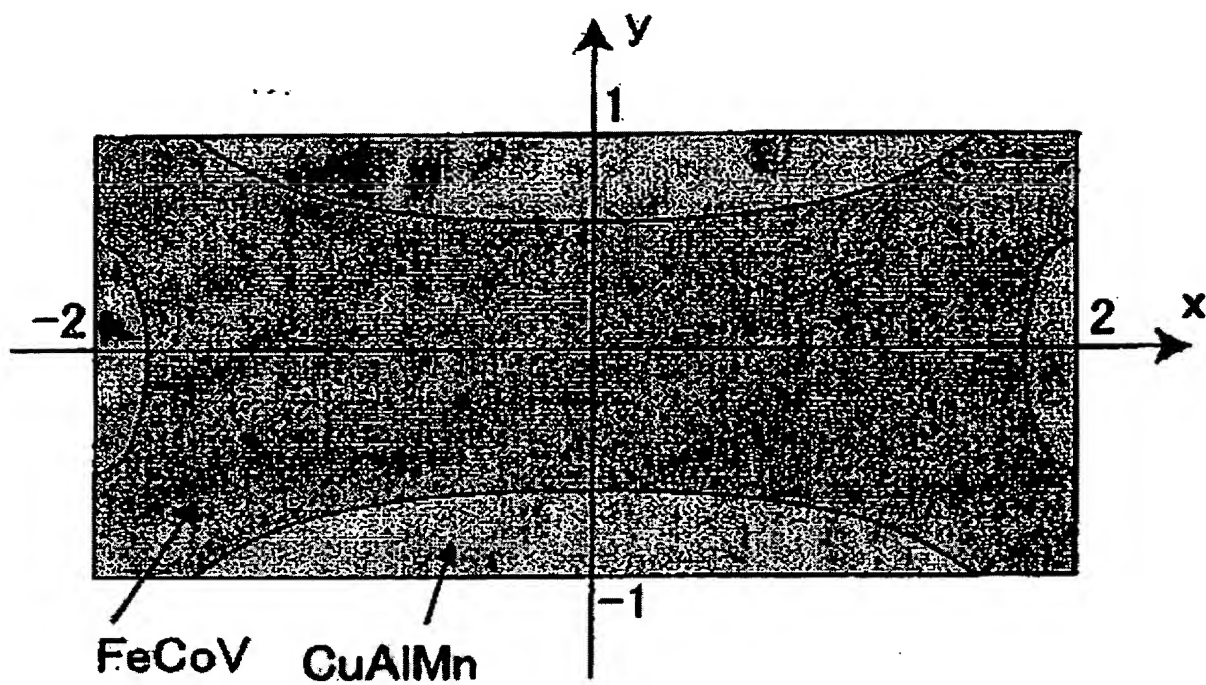


FIG. 34

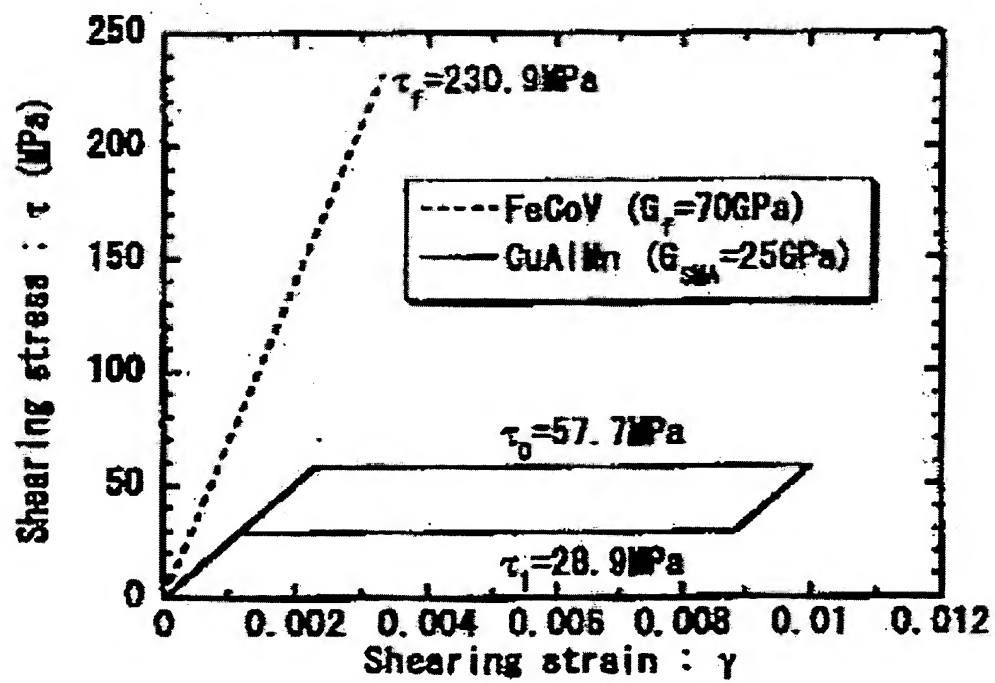
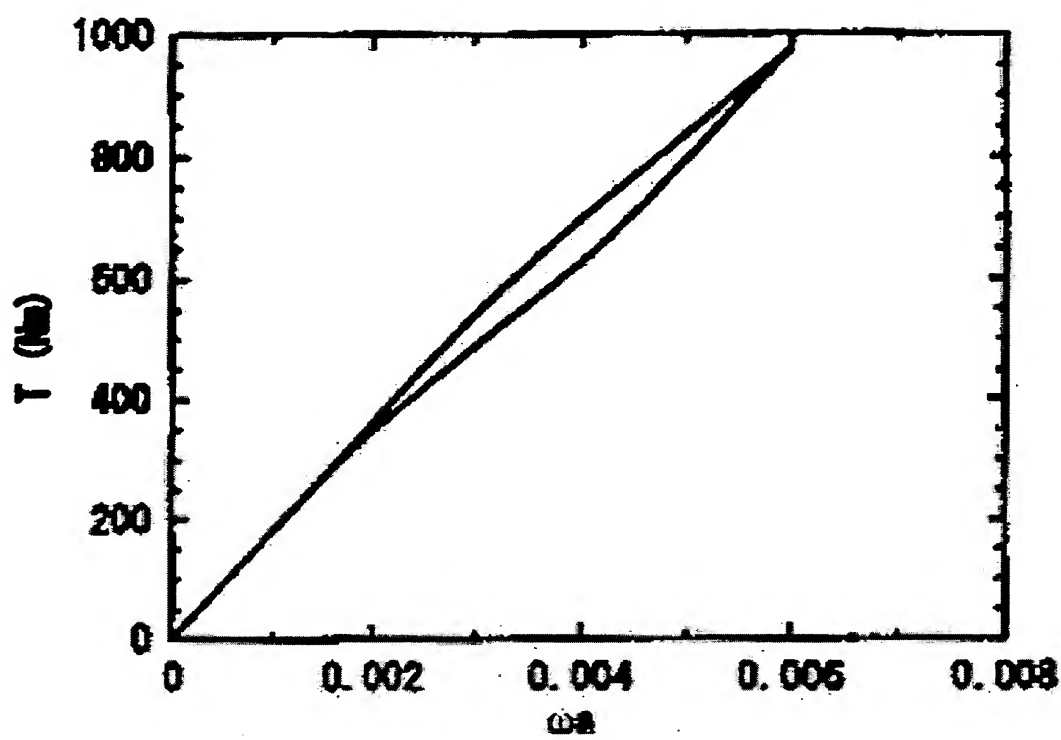
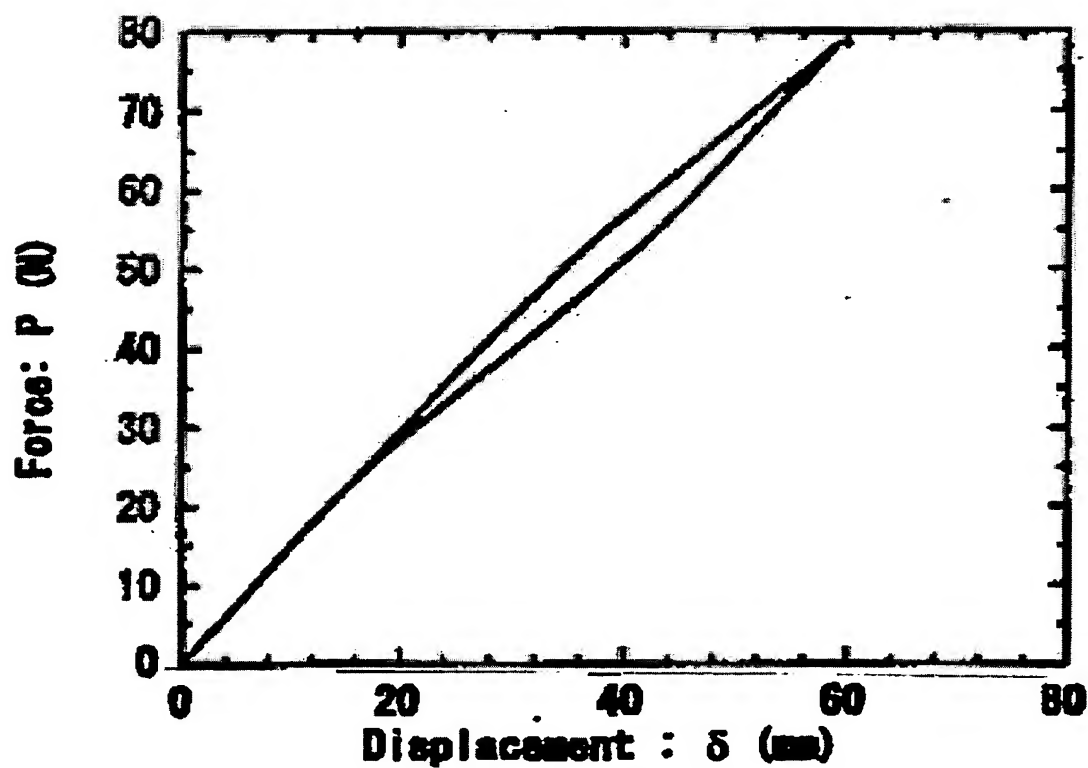


FIG. 35

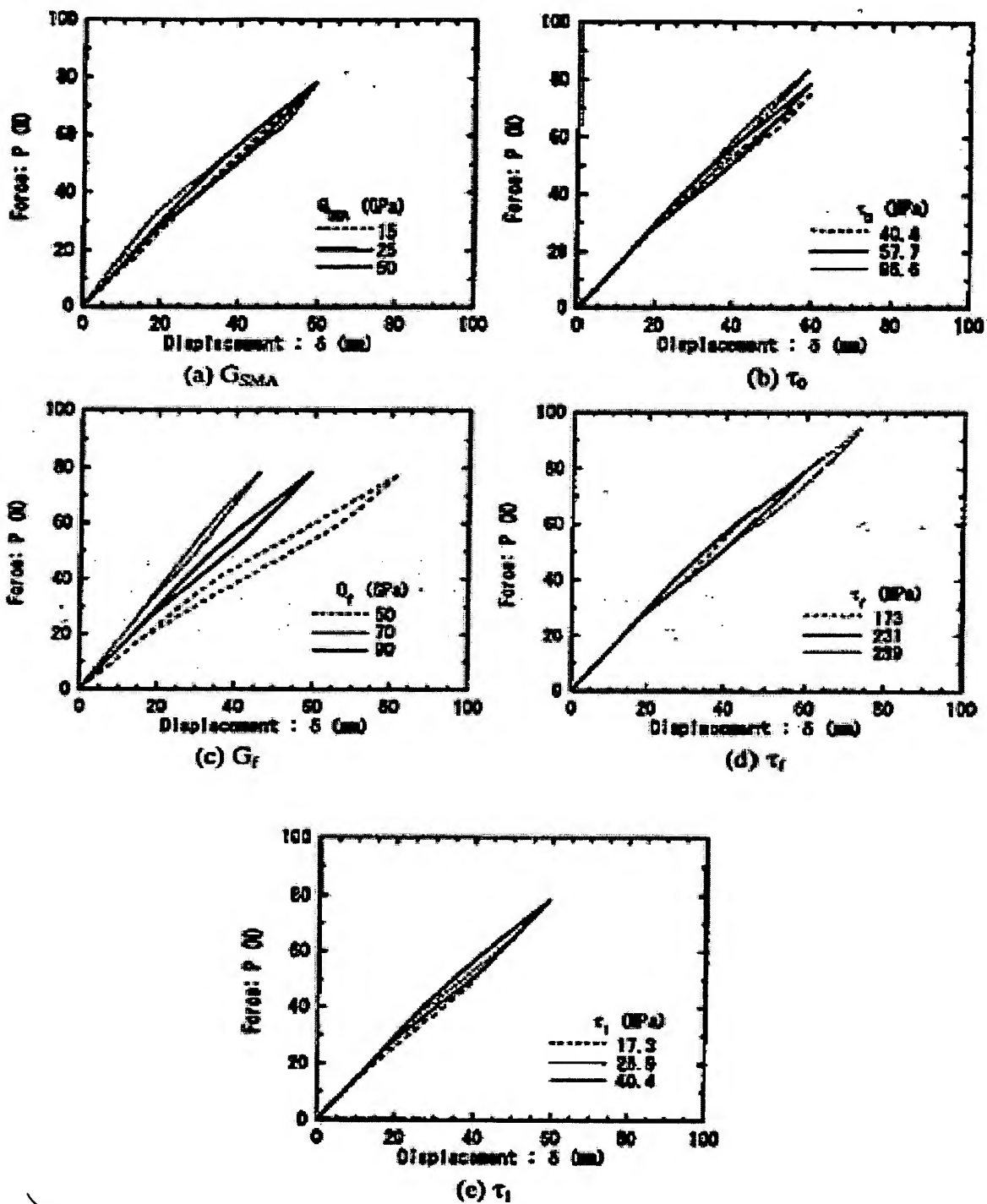




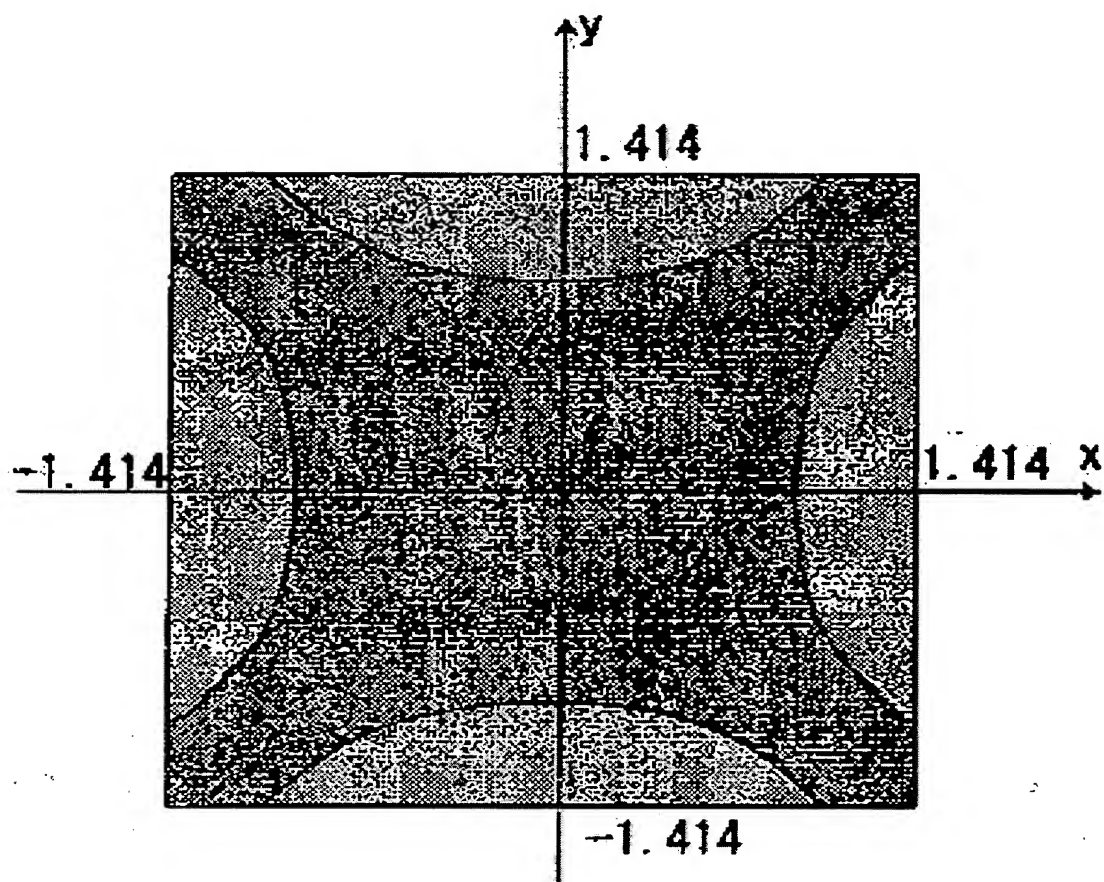
*FIG. 36A*



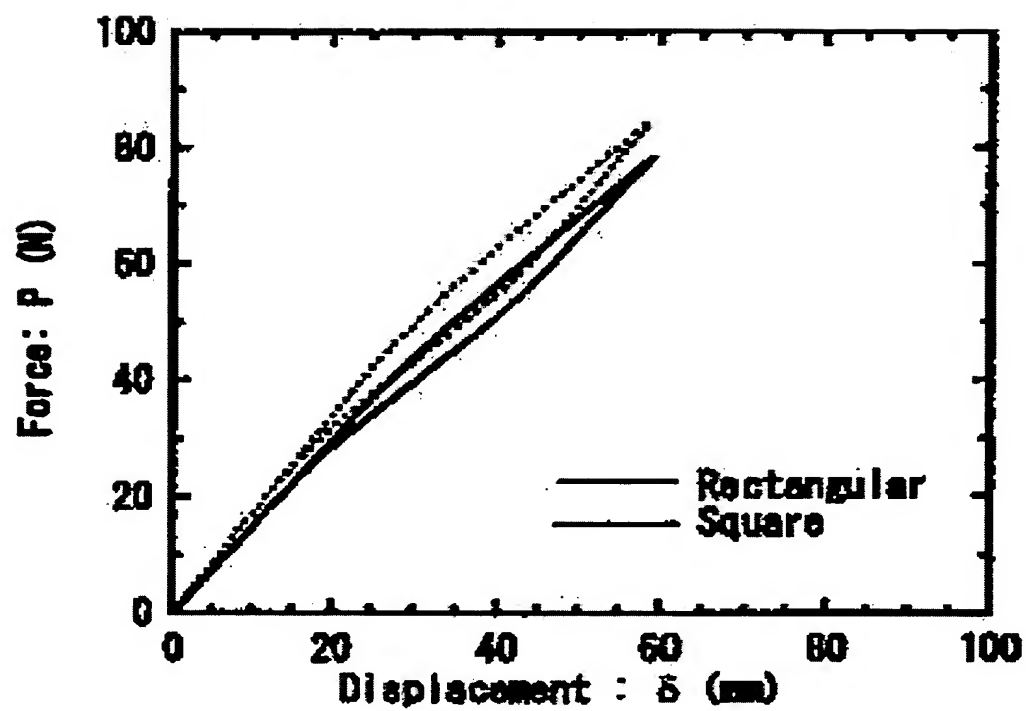
*FIG. 36B*



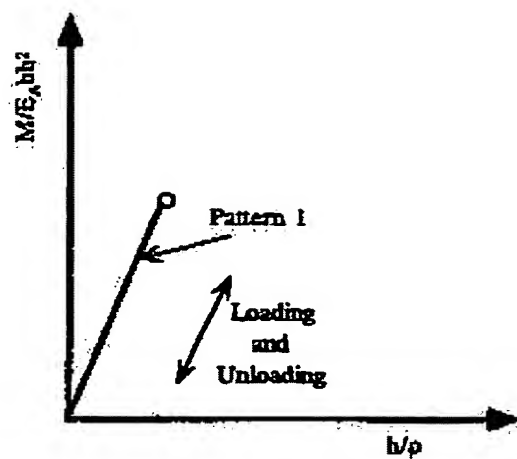
**FIG. 37**



**FIG. 38**

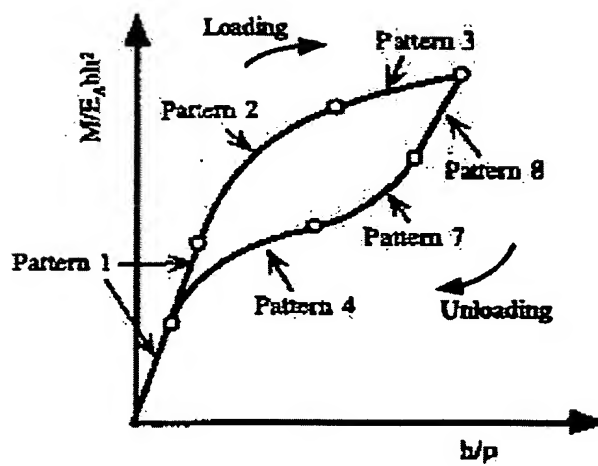
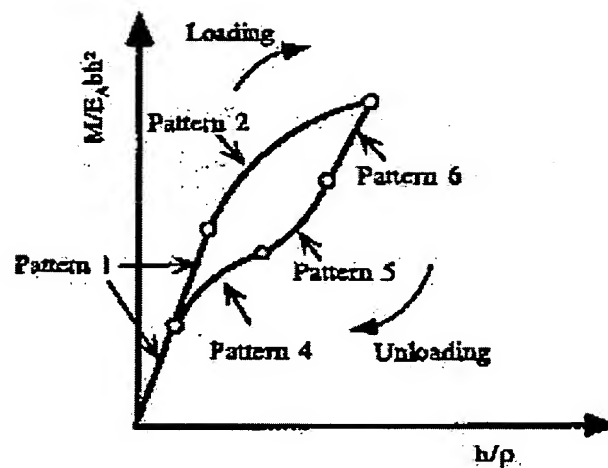


**FIG. 39**



**FIG. 40A**

**FIG. 40B**



**FIG. 40C**